In This Issue: Scientific Salvage for Power Companies

JOURNAL OF ELECTRICITY

VOL. 42 NO. 3 SAN FRANCISCO, FEBRUARY 1, 1919 PER COPY, 25 CENTS

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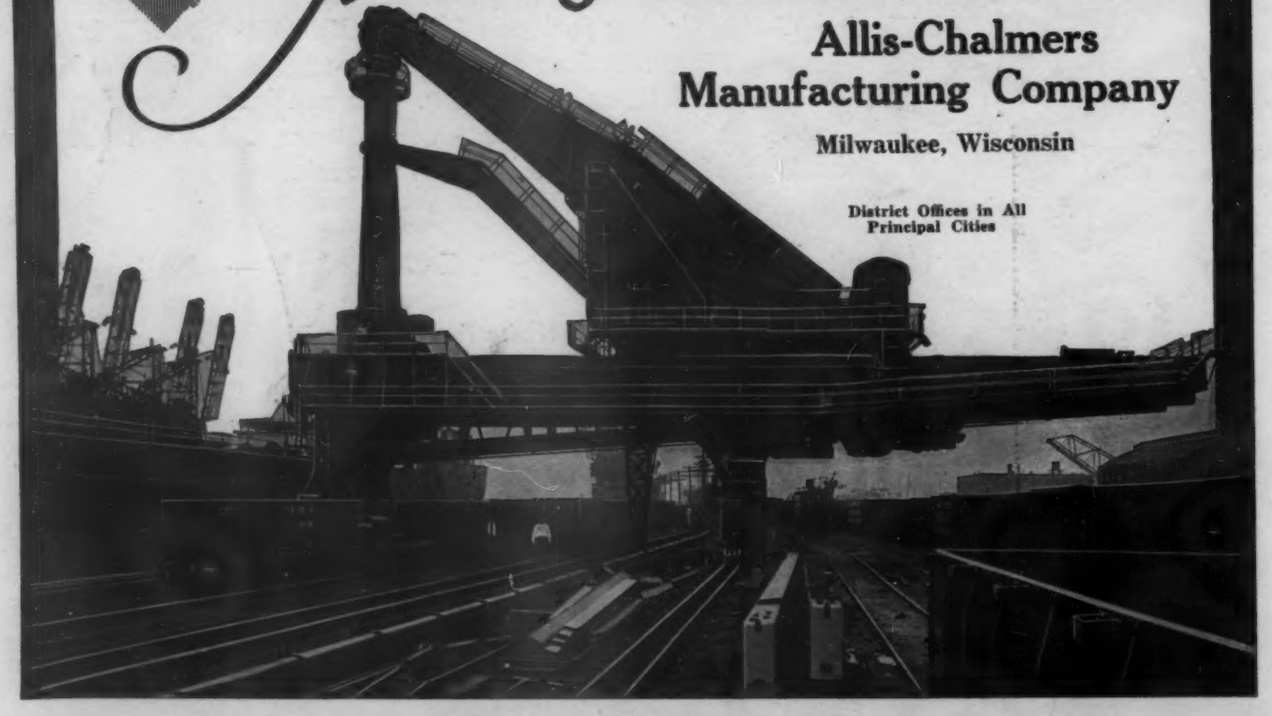

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

VOLUME 42 — SAN FRANCISCO, FEBRUARY 1, 1919 — NUMBER 3

Contents

EDITORIALS 99

"Spread dah News Through France"—A New Record in Electric Heating—The Home Building Outlook Sixteen Millions for California—Record Breaking Output of Petroleum—The Licensing of Engineers—Electric Smelting of Iron at Seattle—Renewed interest in Electrical Engineering—The Purchase of Lower California—New Journal Service.

ELECTRIC HEATING AS A PROFITABLE LOAD — by Barry Dibble 102

The success of the heating load where the power company's business is made up of the purely summer load of irrigation.

SCIENTIFIC SALVAGE — by H. N. Sessions 105

Methods of disposing of scrapped material which bring the efficiency of the company to its highest point and at the same time bring in a tidy sum from odds and ends hitherto wasted.

PROGRESS OF THE CALIFORNIA COOPERATIVE CAMPAIGN 108

A portion of the report of the Advisory Committee which shows the details of what has been undertaken and the excellent success of the work during this last year.

THE DIESEL ENGINE ON SHIP BOARD — by Bruce Lloyd 116

A report of the very successful use of the internal combustion engine as it has been applied to marine propulsion on the Pacific Coast.

NEW CHARTS FOR AERIAL SUSPENSION — by Joseph N. Le Conte 120

A series of charts which will be of practical use to the power man in determining the sag, temperature, tension and other important constants used in aerial suspension design.

WEIGHTS AND MEASURES OF LATIN AMERICA — by Frederick A. Halsey 123

The present positions of the English and metric systems in South America and their bearing on exports from this country and on our own related problems.

THE REGISTRATION OF PROFESSIONAL ENGINEERS 125

An act suggested by the engineering societies of the San Francisco bay region to meet the demand for legislation along these lines which is being felt in the West.

THE SHOP COMMITTEE AND ITS FUNCTION — by J. M. Wadsworth 128

The last of a series of articles from the Fuel Administration in California which points out how the good work of conservation may be carried into peace times.

The Great Northwest Adds New Records in Electrical Achievement—Frontispiece 98
Getting Acquainted with Your Company—by R. B. Mateer 107
Western Ideas 110
Directory of the National Association of Electrical Contractors and Dealers 111
Customers' Comments 112
Advertising Advertisements—by Ira R. Alexander 113
Portland Sign Ordinance 114
Announcing Visitors Electrically 115
Fourteen Rules for Electrical Contracting Practice—Rule VIII 115
Hydroelectric Energy and the Elimination of Waste 119
A Primer of Inductive Interference—by D. I. Cone 122
Telephones the World Over 122
Italy Utilizes Volcanic Power 127
Sparks—Current Fact, Figures and Fancy 129
Personals 130
Meeting Notices for Electrical Men 132
Where Men of the Industry Meet 133
Happenings of the Industry 135
Latest in Everything Electrical 138
Books and Bulletins 140
New Electrical Developments 141
The Vacuum Cleaner 144

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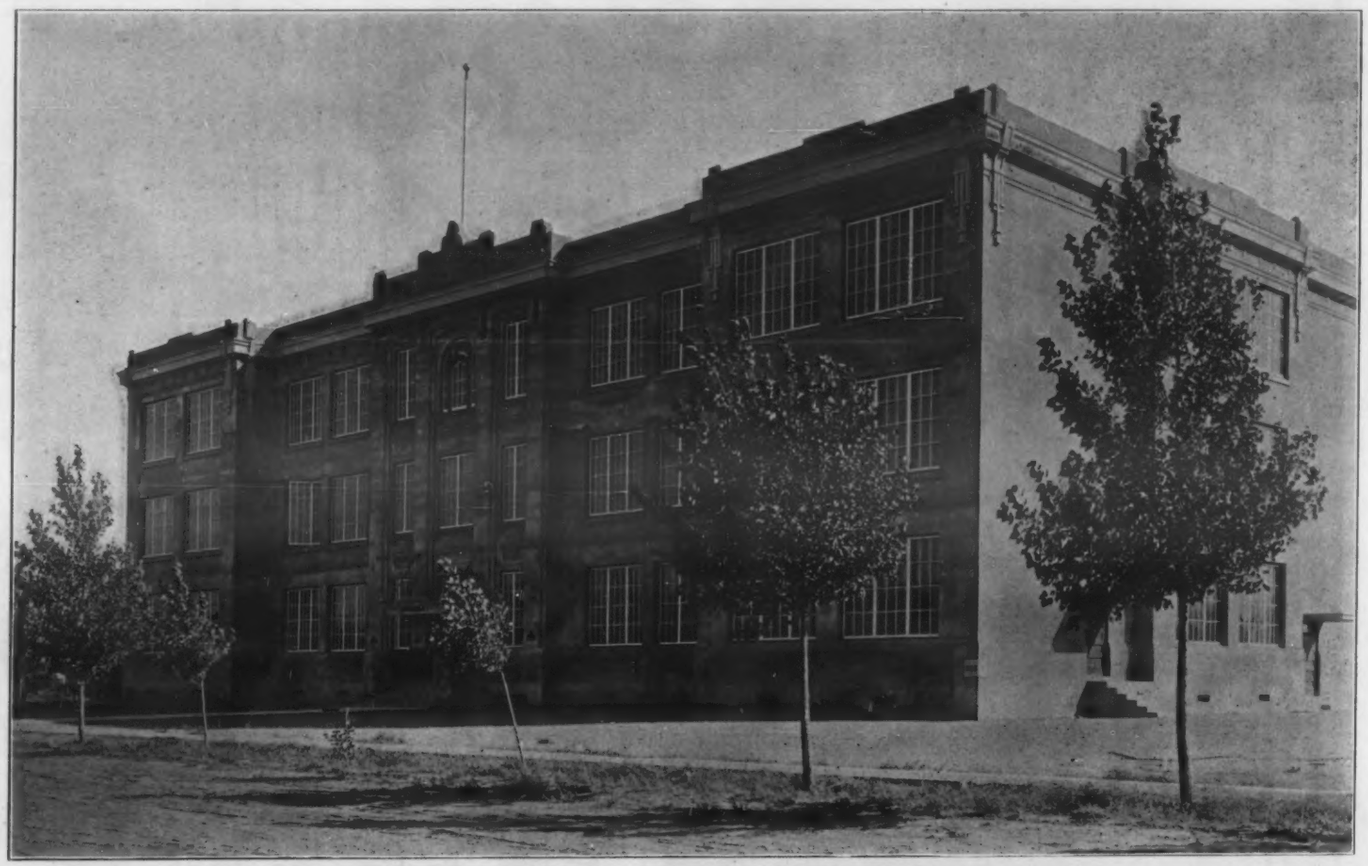
Index to Advertisers—page 20 Where to Buy in the West—pages 21-24



THE GREAT NORTHWEST ADDS NEW RECORDS IN ELECTRICAL ACHIEVEMENT

Here is an exterior view of the Burley High School, situated on the Minidoka Project in Idaho, where buildings are heated electrically to an extent accomplished nowhere else in the world. This particular building contains approximately 700,000 cubic feet of space divided into 31 rooms and offices. The heating plant is very complete. It is provided with tempering and reheating coils, air washer and humidifier, and of course has an electric fan to aid circulation of air. The whole installation is automatically controlled by thermostats to keep a uniform temperature in each room. The heating plant has a capacity of 700 kw. but during the three winters since its installation the greatest demand has only been 350 kw.

FEB -6 1919

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42 SAN FRANCISCO, FEBRUARY 1, 1919 Number 3

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"SPREAD DAH NEWS THROUGH FRANCE" was what the negro sergeant, as he stood in the second line trenches, said he would do if he saw the Germans breaking through the first line system of defense. With the most wonderful period of development for the electrical industry immediately ahead ever experienced in the history of the great West, this is no time for pessimism, for the grouch or for one disappointed in love. Spread the news everywhere.

A New Record in Electric Heating

The Minidoka reclamation project in Idaho has ever held the attention of men of the industry since its early stages of installation, for this project combines reclamation of arid land and the electrical pumping of water upon lands not reached by the gravity system of supply, to a degree not hitherto accomplished elsewhere in the world.

Readers of the Journal of Electricity have on many occasions in the past read in these columns economic data on this development project—how the water is diverted, how this diversion dam is utilized for developing hydroelectric power, and how this self-same power is later used to pump water from the irrigation canals upon vast areas that would otherwise be compelled to remain in their arid condition were it not for electrical pumping.

Now comes another world-beating feat of accomplishment in connection with this scheme of development. The surplus electric power developed at the diversion works is being used for electric heating in a manner that makes a new advance in the electric heating art. This electric power is supplied most efficiently and economically to settlers upon this project, situated in a district where ordinary fuel is difficult and costly to obtain and where winter months often prove severe in temperature.

The electric heating load of this remarkable institution totals 5500 kw., creating a record for power totals of this nature. Another power company, formerly known as the Great Shoshone and Twin Falls Company, now the Idaho Power Company, ranks second in the United States by carrying this form of load to the extent of 3500 kw.

Electric heat, as referred to in this editorial and in the article appearing elsewhere in this issue concerning this record-breaking accomplishment in Idado, applies only to the electricity used for heating buildings. The electricity which is used by these companies for cooking, water heating and other similar ways is placed in an entirely different class.

It has recently been shown at a hearing before the Public Utilities Commission of Idaho that electrical energy can not be sold at a rate which will permit house heating by electricity at costs reasonably comparable to those of coal, except only in those cases such as the Minidoka—where abundant hydro-electric energy would lie idle otherwise during the long winter months. In view of this fact the article appearing elsewhere in this issue on the electric heating load of the Minidoka will prove unusually interesting and instructive.

The Home Building Outlook

The reports of new building permits throughout the West still continue far below normal. Investigation shows, however, that this is due to no feeling of pessimism, but rather to the natural lag necessary between diversion of the thinking mind from intense wartime activities to problems involving home building and expansion of business to meet the needs of readjustment, and especially to catch up, as it were, with building operations discontinued due to urgent representations of the War Industries Board.

Statistics show that in normal years, for instance, 350,000 residences are constructed per year in the United States. During the war period this has fallen so far below normal as to produce a shortage of 700,000 residences. This means that building in the United States must produce this 700,000 residences before normal conditions are reached in addition to 385,000 residences annually to meet the usual increase in population.

In the West, where the urge of youth and the spirit of a budding empire impel men to exert keener endeavor than elsewhere, this building period ahead is now being planned for with unusual care by all those far-sighted men who have in the past had a constructive share in its wonderful growth.

To the electrical man the home building era ahead has unusual fascination. There is no question but that the idea of the electric range, the electric toaster, the electric iron, the electric heating pad and countless other electric appliances for the home has already been sold to the public so effectively that the new home of the immediate future will be so generously wired and equipped for applications electrical as to make the home in the city and upon the farm in the West one beautiful, useful, economic and charming triumph in the application of the unseen energy from our great water resources that are already used to a degree equaled nowhere else in the world.

Sixteen Millions for California

The California Railroad Commission, in its recent approval of the application of the Southern California Edison Company for authority to issue sixteen millions in new securities during the coming three year period, makes for itself the distinction of first place in commission service in the West in the matter of setting in motion much needed financial assistance for new power development work.

The Commission's order authorizes the company to issue $8,000,000 of twenty-five-year 6 per cent general and refunding bonds to take up a like amount of short time bonds maturing July 1, 1919. Also the company is authorized to issue $8,000,000 serial 7 per cent debentures, maturing in from one to ten years, to meet bills payable amounting to slightly over six million dollars, representing construction work. The bonds are to be sold at not less than 93% and accrued interest.

This large amount of new securities will greatly facilitate additional construction work and give added confidence throughout the West, in that relief is thus acquired for a large quantity of short time paper that has accumulated during the war period. As this splendid new security issue and authorization becomes more widely known in financial and utility circles unquestionably it will be one of the factors that will aid greatly in forwarding to even further limits the already marked prevailing tone of optimism that exists in these circles throughout the West.

Record Breaking Output of Petroleum

It is interesting to note that the magnificent effort made in the West to increase the production of crude petroleum during last year met with ready response from all quarters. Nowhere else in the nation did the oil fields increase production to the degree that was accomplished in California. Indeed, the great Oklahoma-Kansas fields, the largest producers in the nation, actually dropped off in production from 155 millions of barrels to 139 millions, while California increased its production from 94 millions to 101 millions.

This enormously increased production enabled the country as a whole to put out a vast total of 345,500,000 barrels in 1918 as opposed to 335,310,000 barrels in 1917. According to statistics from the U. S. Geological Survey, the output in 1918 includes no less than 6,500,000 barrels of crude oil removed from field storage but excludes drafts aggregating 20,500,000 additional barrels from stocks of pipe-line companies. The surface reserve of crude oil held by oil producers and pipe-line companies in the United States at the end of 1918 is estimated at 123,000,000 barrels, compared with 150,000,000 barrels at the end of 1917. These figures show that the demand for domestic petroleum in 1918 amounted to about 366,000,000 barrels. The exports of crude oil, most of it to Canada and to northwestern Mexico, aggregated about 5,500,000 barrels, leaving a total of 360,500,000 barrels available to supply domestic needs. This quantity was insufficient, however, and about 36,500,000 barrels was imported, nearly all of it from Mexico, to meet the domestic requirements, which amounted in all to about 397,000,000 barrels.

The increase in output was made in response to a steadily growing demand for petroleum, expressed in advancing prices for crude oil, which were stabilized, with Government approval, at record levels during the closing months of the year. These high prices of fuel oil have had the effect, however, of causing considerable investigation in the West looking to the use of fuel substitutes. As a result it is to be expected that the near future will witness the development of the use of powdered coal and pulverized fuels to an extent that will materially affect the use of fuel oil in steam electric generation.

The Licensing of Engineers

There is much interest at the present time in proposed legislation looking toward the licensing of engineers in several commonwealths of the West. Wyoming, a state that has so excellently taken the lead in handling of its water appropriations for many years past, has during this same period had a system of licensing its engineers, largely by having them pass oral and written examinations. The system as a whole has proved satisfactory.

In California during the legislative sessions of two years ago a bill was proposed by the architects that was bitterly opposed and finally defeated, due to the efforts of the engineering fraternity as a whole, for it was felt that the architect was attempting to limit the scope and activity of the engineer to an unjust degree in regard to structural matters wherein the engineer is admittedly the authority in design.

During the present session of the legislatures in various commonwealths of the West it is possible that bills will be introduced which will touch upon this important subject. It would seem that the whole movement has merit, if it succeeds in passing legislation that will tend to prevent the so-called "curb-stone" engineer from attempting to practice the engineering profession and thus insure to the public the confidence in the profession commensurate with the dignity and high ethical standard now maintained by the profession as a whole.

In the matter of fees for those engineers from without the state who desire to practice within its confines, care should be taken that no unreasonably large fees be exacted, as it must be remembered that a number of our most noted engineers are now practicing in many different states. Hence retaliatory legislation may make such fees unjustly burdensome or foreign to the spirit of the movement which is to protect the standard of the profession rather than to legislate against any particular class.

The entire matter of licensing engineers is now receiving careful consideration by practically every group of the profession so that it is believed that such legislation as may be enacted will be accomplished only after most careful scrutiny and overhauling by those most capable to judge of its possible influence for the good of the profession.

Electric Smelting of Iron at Seattle

One of the big factors that has always been present to attempt to retard the industrial growth of the West is the almost total lack of iron production in this vast district. Readers of the Journal of Electricity are familiar with the long series of investigations undertaken at Heroult, California, and other instances wherein definite progress has been made in the method electrical for the smelting of iron ores.

It now appears that another mile post of progress is to be reached in the smelting of iron ore at Seattle. In this enterprising industrial district, the Smelters Steel Company is constructing a plant on the Commercial Waterway for the smelting of iron ore from its mines in British Columbia. The company is to install four electric furnaces which are to have a total capacity of thirty tons of output in high grade gray iron per day. The furnaces are to be of the arc type with one electrode to each furnace. The ore is an iron oxide and the company is said to have abundant flux necessary for its smelting purposes near the mine.

The use of the electric arc in the smelting of iron ore is fast passing the experimental stage, and the fortunate location of vast iron ore deposits in many sections of the West, where potential possibilities for hydroelectric development reach gigantic proportions augurs much for the continued industrial development of the West, especially in those industries where iron and steel play an important role.

Renewed Interest in Electrical Engineering

The successful outcome of the war and the tremendous part played by electricity and by men of electrical engineering profession have again stimulated an interest in this industry never before realized even in its many successful years of the past. Although some of this interest may be attributable to a passing fascination for the brilliant accomplishments of the war, those who look deeply into the subject realize that this interest has a far deeper significance. In a word, it is unquestionably the result of a growing conviction that no matter what direction renewed activity may take, electricity is bound to play a leading and indispensable part in world reconstruction.

And this is why students are indicating a leading preference for electrical engineering in the great colleges and universities of the West. Take as an instance the University of California. A recent survey made by the university authorities among the student army training camp indicates some interesting forecasts. Statistics show that approximately 58 per cent of the 388 freshmen who expect to continue college work will pursue technical courses. The greatest number of individuals expect to enter the College of Commerce; electrical engineering is next; chemistry third; and agriculture fourth.

The vision of industrial and commercial development at home and abroad, combined with the necessity not only for a thorough business training but also a training in the fundamentals of a specialty, seems to be the urge that is leading these young men in their choice. And in this choice thoughtful men cannot help but concur.

The Purchase of Lower California

Considerable comment has been made lately concerning the purchase of Lower California from Mexico. From the viewpoint of an investment some scheme whereby stability to development of this peninsula may be assured is much to be desired. While the country is arid and at present practically worthless, unquestionably its scientific development, with tremendous financial resources available, would result in much good being accomplished in reclaiming a large territory for the use of man that is now of little value.

To the development of major engineering operations along the Mexican border in California and Arizona the purchase of this tract so as to include both sides of the Colorado river would be very helpful at this period. The Imperial Valley and other arid districts along the southern border are dependent upon this river for water and power, and in this utilization the rights of the Mexican government come in for consideration. Looking at the problem from the broadest humanitarian viewpoint possible —namely, that viewpoint that would bring about the greatest utilization for all the territory involved—if some amicable arrangement can be arrived at whereby this entire territory, both Mexican and American, can be developed without friction and with assured stability of government, such an arrangement would mean much for the continued and unhampered commercial and engineering development of the great West and the lands bordering the Pacific.

We only have to look to Alaska as an instance of possibility of development under a strong and firm governmental hand and then compare with it Siberia, its neighbor. Siberia is admittedly a country teeming with resources and opportunities for man and yet the very instability of government has delayed its development fully fifty years. Alaska, meanwhile, a former territory belonging to Russia, has under its fifty years of ownership by the United States produced in mineral ores alone—gold, silver, copper and other products—nearly a half billion dollars.

THE NEW JOURNAL SERVICE: The pronounced demand for ideas looking toward renewed business building activity has led the Journal of Electricity to devote the leading features of the issue of February 15, 1919, to the electrical contractor-dealer in his work in large business buildings. To this end articles setting forth electrical equipment and special convenience appliances for large office buildings and department stores will be featured. Another feature will be an article by H. A. Lemmon on advertising that to the salesman will prove intensely interesting and helpful.

Taken as a whole these features, combined with the splendid ideas and suggestions from the California Electrical Cooperative Campaign that will appear in the next issue of the Journal of Electricity, should prove unusually stimulating and helpful in renewed activities of the contractor-dealer that are beginning to be felt in many quarters.

ELECTRIC HEATING AS A PROFITABLE LOAD

BY BARRY DIBBLE

(The following data on the cost and revenue of electric heating on the Minidoka Project, Idaho, were prepared at the request of the Idaho Public Utilities Commission—and very graphically point out the possibilities in the heating load for the power company with an irrigation demand for the summer months. The author is project manager of the U. S. Reclamation Service in this district.—The Editor.)

The developments in the commercial use of electric energy on the Minidoka project of the U. S. Reclamation Service are the outgrowth of the rather exceptional conditions under which the power system was installed. The generating station itself was built primarily to supply power for irrigation pumping on the project. It has a rated capacity of 7000 kilowatts, and a maximum of about 7800 kilowatts. Practically all of this is required in the summer for pumping. It was anticipated that with the development of the project a demand for electricity would be created in the towns and rural communities both for domestic use and for manufacturing, but it was realized that the growth of this ordinary load would be comparatively slow and that it would be many years before these requirements of the towns would be an appreciable part of the capacity of the powerhouse. As a matter of fact the ordinary commercial load on the Minidoka system has now, after ten years, reached a maximum demand of only 750 kilowatts or 10% of the generating capacity, although the lamps, motors and appliances connected to the commercial lines of the system would, if all used at once, require 3478 kilowatts.

THE U. S. RECLAMATION OFFICE AT RUPERT

With a pumping load almost entirely confined to the summer months, the taking on of a heating load in the winter has here proved commercially practicable. Small houses and large—on this project all are electrically heated.

A Winter Load Needed

Under these conditions it was deemed expedient to find some other and more unusual load so that the powerhouse might be efficiently operated throughout the year. At the time this subject was under consideration, in 1909 and 1910, the Great Shoshone and Twin Falls Water Power Company, operating in the territory immediately west of the Minidoka project, was carrying out with some success experiments in electric heating for dwelling and other buildings. This electric heating load appeared to be the only one that could be secured that would satisfy the conditions of the Minidoka system. These permitted of carrying a heavy load in the winter but required that the demand be reduced to practically nothing in the summer. It was necessary that the extra investment required should be moderate and it was desirable that the benefit from the use of this power should be widely distributed among the population and result in conservation of the natural resources. It was apparent that electric heating would have to be supplied at a price very much lower than the customary rates for electricity in order that it might supplant coal, in fact the rate must be much below the average cost of supply. However, in supplying electricity for heating, use was made of a power station that was already installed and operated for other purposes, and a transmission line which was needed to supply the ordinary requirements of the towns. Therefore the additional expense of carrying the heating load was confined to the extra substation equipment required by the Reclamation Service and to the additional copper and transformer capacity needed by the retail company in the distribution of electricity to the consumers, together with an allowance for bookkeeping and other operating expenses caused by the extra business.

Within a few years the heating load has increased to such an extent that it was necessary to build a duplicate transmission line about 13 miles long at an expense of over $11,000.

Of late years the demand for electric heat has increased rapidly until during the calendar year 1917 the substation in Rupert (population about 2000) carried a load of 2000 kilowatts, while that in Burley (population about 3500) carried 2500 kilowatts, of which heating accounted for over 90 per cent. There was also some heating load on other substations. The maximum heating demand during 1917 was 4707 kilowatts. The point has now been reached where any material increase in the heating load will require a corresponding increase in the copper in the present transmission lines.

Estimating Cost

An effort has been made to estimate the cost of supplying electricity for heating in the towns on the Minidoka project. In doing so figures for 1917 are used as this is the latest period for which complete data is available. Two methods of computation are used, the first to arrive at the additional expense caused by the heating load; the second to determine the charge that the heating service would have to bear if it were to carry its proportionate share of the costs of the entire electric system. In this connection it should be explained that the Reclamation Service in general acts as a wholesaler of electric energy. It generates, transmits, and transforms the

energy, delivering it to distributing companies at the switchboards of the substations. Therefore the costs shown below carry the electricity only to the substation switchboard. The retail company, or distributer, carries the additional burden of costs required to serve the consumer. At best these costs can only be approximations, because of the many factors that enter into any discussion of this cost and the many more or less arbitrary assumptions that must be made, where a determination is attempted

THE HIGH SCHOOL AT RUPERT ELECTRICALLY HEATED
The substation at Rupert during 1917 carried a load of 2000 kilowatts, of which heating accounted for over 90 per cent.

of the costs entering into the carrying of one particular class of business. No attempt has been made to split hairs, but it is believed that these figures give a fairly accurate idea of the conditions they are intended to explain under the particular conditions that are involved.

In the first case it is assumed that no additional expense at the power house is necessary because of the heating load; in other words, that the power house must be operated to supply lights and other ordinary appliances in the towns, that no additional attendance is necessary because of the operation of extra units; that the additional oil and supplies required are negligible and that extra wear and tear on the units due to operation is not greater than the deterioration that would occur if some of them were idle and one were in operation at fractional load. Therefore no charge from the power house is made to the electric heating service. It is further assumed that the electric heating should bear an expense on account of the transmission lines proportional only to the additional investment in lines that was made necessary because of the heating load. This covers the line referred to previously. For the year 1917 this represented 29.6% of the total charged to commercial power system for transmission lines. As for the substation, it is assumed that the operation (including ordinary inspection, meter reading, etc.) would have been about the same for a small station as for a large one. Therefore no charge is made to the heating service for this item. However, the cost of repairs or maintenance and the depreciation are materially increased because of the greater transformer and switchboard capacity installed to take care of the heating load. It is assumed that these charges should be divided in proportion to the "light and appliance" and "heating" peaks of the year. This makes the charge to the heating service 84.6% of the total. There is a considerable item of expense in conducting the sale of electricity due to bookkeeping, reading meters, taking care of complaints, soliciting new business, etc. This cost is here divided in proportion to the revenue from the different classes of business.

Following the above outline, the additional cost to the Reclamation Service of the electric heating business is as summarized in Table I up to and including the delivery of the energy to the distributer at substation switchboard.

TABLE I
Additional Cost of Supplying Electricity for Heating During Calendar Year 1917

	Total	Per Kw. of maximum demand
Powerhouse	None	
Transmission lines:		
Operation	$158.80	
Maintenance	251.50	
Depreciation	1080.00	
Sub-total	$1490.30	$0.32
Substations:		
Operation	None	
Maintenance	3754.63	
Depreciation	2030.00	
	$5784.63	1.23
Sale of Electricity	2037.40	.43
Total	$9312.33	$1.98

In this connection it may be said that the average revenue of the Reclamation Service from the sale of electricity for heating service was $3.78 per kilowatt for the year 1917. Thus, neglecting all costs except those additional ones listed in Table I, the electric heating business showed a surplus of $1.80 per kilowatt for the year. This is equivalent to a return of 13.0% on the extra investment required. This surplus is available to cover such charges as insurance, interest on the investment and, in the case of a private company, taxes. If this surplus is figured as a return on the total investment in the power system in the proportion that it is used, the rate of return becomes only 3.3%.

No concern could operate long if it omitted from its computation of costs all items except the additional ones incurred in handling a particular line of business. It has been the practice of the Reclamation Service to prorate all expenses as nearly as may be to the feature benefited. Thus, the power house costs are divided in proportion to the number of kilowatt hours delivered for various uses. During 1917 there were delivered 38,500,000 kilowatt hours on the Minidoka system of which 19,700,000 were used in the Government pumping plants, and 18,800,000 were sold. Of the latter nearly 15,800,000 were used for electric heating. In the case of the transmission lines at the end of 1917 there were 26.8 miles in the system that had been erected primarily to reach the pumping stations and 46.6 to serve the commercial consumers. The total costs are divided between the pumping and power units in proportion to this mileage. It then seems logical to divide the charge to the power system so that the heating service will carry an amount proportionate to the kilowatt hours used for that purpose. In table II the substation costs and the expense of handling the sale of electricity are also divided on a kilowatt hour basis.

TABLE II

Cost of Heating Service Based on Average Cost per Kilowatt Hour During Calendar Year 1917

	Total	Per kw-hr.	Per kw. of maximum demand
Powerhouse:			
Operation	$ 5750.00		
Maintenance	1561.46		
Depreciation	6123.24		
Sub-total	13,434.70	0.00083	$2.86
Transmission lines:			
Operation	464.09		
Maintenance	735.15		
Depreciation	3167.60		
Sub-total	4366.84	0.00027	0.93
Substations:			
Operation	1117.22		
Maintenance	3842.63		
Depreciation	2078.00		
Sub-total	7037.85	0.00043	1.49
Sale of Electricity	4795.40	0.00030	1.02
Total	$29,634.79	$0.00183	$6.30

In both tables I and II the annual depreciation charges are arrived at by using the following percentages of the first cost:

Powerhouse—	
Structure	2%
Equipment (average)	4.7%
Transmission lines—	
Poles and fixtures	12%
Wire	2%
Substations—	
Structures	2%
Switchboard and cables	8%
Transformers and all other items	5%

It should be noted that if there had been no summer irrigation load on the power house against which could be charged practically half of the annual expense, then the heating load would have had to bear approximately twice the power house charges shown in Table II. This would have a very material effect on the entire situation. Indeed in such a case, the investment in the power house could not have been justified if the major portion of the installation had been made only to meet this demand.

The Methods of Proportioning Costs

It is realized that many different methods of dividing costs might be followed in arriving at a figure for the electric heating service and it is probable that arguments both for and against each of the methods could be made. It has long been recognized as a principle of rate making that if a system is underloaded, it is justifiable and good business to take on a load that will more than pay the extra expense that it entails. Such a load, while it may not carry its pro rata share of the cost, at least helps in some degree to meet the fixed expenses that otherwise would have to be met from other sources. However, it is logical to expect and require that a load which can not afford to pay average costs should at least contribute all it can afford to the expense of operating the concern. In order to arrive at what this contribution might be in the case of the heating load, it is interesting to compare the cost of coal and electricity on a heat-unit basis. Available coal may be roughly assumed to contain 12,000 B.t.u. per pound or 24,000,000 per ton. After allowing for losses in heat that goes up the chimney, unburned coal in the ashes, waste due to holding the fire longer than needed, and to slacking in the coal pile, it is probably liberal to assume an efficiency of 33 1/3%. In other words, only 8,000,000 B.t.u. will be effectively used per ton of coal. One kilowatt hour of electricity is equivalent to 3416 B.t.u. and a kilowatt month to 2,459,530 B.t.u. One hundred per cent of the electrical energy delivered to the heating device is converted into heat. In Idaho it is customary to sell electricity for heating on a flat rate per kilowatt of demand for the month or season. The consumer cannot use his electric heat effectively every hour of the day nor every day in the month. On this account the efficiency of use of electricity for heating probably runs around 66 2/3% or perhaps it would be better to consider that the load factor would be 66 2/3% if the electricity were switched off when not needed. This would make the effective heat per kilowatt of maximum demand 1,640,000 B.t.u. per month. In other words one ton of coal per month is equivalent to 4.9 or say 5.0 kilowatts when used for heating. This is borne out by experience on the Minidoka project. Thus electricity at $1.60 per kilowatt of maximum demand is on an equality with $8.00 coal.

The increased cleanliness and convenience of electricity is a factor that should be taken into account. If it is assumed that because of this feature the consumer will pay 25% more for electricity than he would have to pay for coal, the indications are that electricity at $2.00 per month per kilowatt will compete with coal at $8.00 per ton. It has been found on the Minidoka project that the average season for the heating load is from five to six months. In other words, the total consumption of electricity for heating is equivalent to five or six months' continuous use of the maximum demand. Therefore a retail revenue can be expected from this business of from $10.00 to $12.00 per kilowatt per season.

It will be understood that the figures given in the foregoing paragraph are for average conditions in the territory served by the Reclamation Service on the Minidoka project in Idaho. In a particular case even within this territory the results may vary materially from the average because of the type or size of the heating plant or the care and skill with which it is handled. In general, the smaller the building the more economical is the use of electricity.

Maximum Demand Basis for Charges

It is sometimes suggested that electricity for heating should be sold by meter at a kilowatt hour rate. This would undoubtedly reduce considerably the kilowatt hour consumption. However, it will be apparent without discussion that the cost of supplying this load depends upon the maximum demand rather than upon the length of time the demand is used. At best there is very little diversity in the demand. When the weather is cold every one wants the heat at the same time and equipment must be provided to care for this condition. The revenue per season must be the same per kilowatt of maximum demand and therefore the reduction in kilowatt hour consumption on a metered basis would have to be met by a corresponding increase in the rate. In fact, when electricity is sold on a maximum demand basis the tendency is to keep down the peak load by closing some rooms in extremely cold weather. On

the other hand, if it were sold on a kilowatt-hour basis, consumers would undoubtedly be inclined to put on some additional heaters for the cold weather and this would increase the necessary power equipment required. As the use of this additional equipment measured in kilowatt hours would be slight, the average rate would actually have to be increased to cover the extra costs.

In conclusion it should be emphasized that the data given above apply only to the peculiar conditions prevailing on the Minidoka project and cannot be safely applied to other power systems. It can be said that electric heating is sometimes justified as a "by-product" load, but that rarely if ever will it be economically feasible to develop electricity from water power for the prime purpose of using it generally to heat buildings where fuel can be obtained at reasonable prices.

SCIENTIFIC SALVAGE

BY H. N. SESSIONS

(Salvaging waste materials is clear gain. The system of army salvage has become one of the essential elements in the conducting of the war—and the problem is one of peace as well. How the clearing up of the junk pile in a power company's organization can be made a source of profit rather than an expense is here interestingly told by the commercial engineer of the Southern California Edison Company, who has directed the salvage work of that company. —The Editor.)

The Need for Thrift

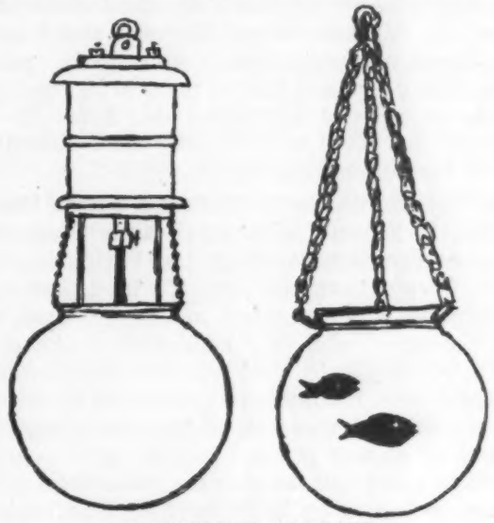
To the public utility aiming to properly conserve its resources, the science of salvage is indispensable. The value of the science is not conspicuous to the uninitiated; however, one proficient in its practice sees the possibility of accomplishing astonishing results in the development of thrift to the highest degree by the central station. For lack of knowledge, the advantages of salvage are too often overlooked and its neglect actually lowers the efficiency and morale of each branch of an organization.

Bearing in mind the warning, "There is a withholding that leads to poverty," let us take for example and analysis a central station which for want of funds sees no possibility to purchase additional equipment—for instance, a needed new boiler or a fuel economizer—yet through force of habit or a false sense of attachment there is being unconsciously retained in possession miscellaneous inactive and obsolete material which could be salvaged, let us assume, for $10,000, a sum ample to secure the necessary new equipment.

The Burden of Unsalvaged Scrap

What has the burden been to this central station in the holding of this idle, second-hand and obsolete property? The vain hope held out of applying it somewhere has kept it a subject of annoyance, costing the management's time and attention. Efforts to adapt it here and there have expended labor and material in moving and fitting. Because of its second-hand character there is a natural tendency to disregard its value; hence extraordinary depreciation occurs through careless handling. The expense of maintaining an accurate record and inventory of such stock is surprising. It has cost labor and valuable space to store. The interest on the investment and its insurance must not be overlooked. Its presence has marred and encumbered many a spot that would otherwise have a clean and business-like appearance. Take the loss to this central station through the withholding of these dead articles and compare it with the reward of resurrecting them by salvage, in the form of ten thousand live, hard-working dollars. Besides, isn't it much nicer in every respect for the treasurer to hold in his money drawer this extract of all the good there can be in these things?

Because the necessity of salvage does not stare the central station manager smack in the face as it does the commander of the ocean greyhound, the former is often distressingly ignorant and the latter particularly wise and efficient in this respect. The service of the ocean liner is perfect service or no



A CONVERTED ARC LAMP

More profitable avenues for salvage than the junk dealer are to be found. It was discovered, for instance, that the globes to old arc lamps could be sold to a certain Japanese dealer for use as fish bowls.

service and perhaps peril, unless through salvage the boat is kept in "shipshape." The central station manager who says, "Don't waste my time on salvage, I have other worries," soon finds his property in an unthrifty and unhealthy condition. It is time he awakens and redeems his superfluous property, whatever and wherever it may be, into cash; and it might at the same time be appropriate for him to apply this wholesome exercise on himself by turning fat into muscle and languor into pep. It is not peculiar, therefore, that the central station neglecting salvage is usually found weak otherwise, and particularly so in the collection of its accounts; for the salvaging of delinquent bills earns many a dollar by saving it from loss through bad debts.

Better Markets Than the Junk Man

The salvage expert knows no such word as "waste." From Nature's law of compensation, he realizes that nothing can be destroyed. He knows that if equipment or material has lost its usefulness for one purpose, it is still either in part or whole valuable for another purpose, and to discover this use he has the pleasure and the interesting task of exploring many trades and industries and he is handsomely rewarded in the discovery of markets far better than the junk syndicate.

With the knowledge of how scrap can be used and sold to the best advantage, the matter of salvage

In this case by uniting two discarded shades, an attractive punch or fruit bowl is achieved. The man who achieves this result can afford to pay the power company for the glassware more than can the rags-bottle-sacks man.

can be made one of simple merchandising. The salvage salesman, however, is not welcomed with gracious arms. Running up the selling price of an obviously rundown article is no snap. Success rests entirely on his knowledge, diligence and ingenuity. It is human nature to take interest in the purchase of something new and just as natural to lose interest in what becomes of something old; hence the work of the salvage agent is necessarily more difficult than that of the purchasing agent.

The Way the Southern California Edison Does It

The Southern California Edison Company, in its recent consolidation with the Pacific Light and Power Corporation, the Mt. Whitney Power and Electric Company and other smaller concerns, found itself possessed of a very considerable amount and variety of duplicate and surplus machinery and equipment and, fortunately, because of its organization on salvage, almost all of this has already been disposed of at war prices. Salvage of this did not altogether mean sale, as in some cases worn machinery was reclaimed by the interchange and substitution of parts, while other material was retreated for use again. This property consisted of buildings, tents, furniture, utensils and provisions, live stock and wagons, hospital apparatus, railroad equipment including steam locomotives and cars, mining machinery, gasoline locomotives, automobiles, steam shovels, rock crushers, cement mixers, hoists, derricks, steel tanks, cable, chain, pipe, tools, etc., in fact, almost every conceivable machine and material used in the construction and operation of hydro, steam, compressed air, gas and electric plants. The majority of this property was sold as usable equipment directly to the actual users at prices in some cases even above its original cost, due to the scarcity and demand caused by the war.

Sorting the Material

The culling of scrap material requires considerable skill, watchfulness and judgment, particularly in the grading of metals. After a pile of iron has been separated into cast iron, cast steel, wrought iron, various kinds of wrought steel, and from the whole are picked all pieces such as rods, tubes, sheets, etc., having greater value than pure rolling mill or foundry stock, then the matter of selling the remainder is simple. The U. S. Steel Administration had for some time fixed a minimum price on steel and iron and the mills and foundries engaged on government contracts, by agreement with the scrap dealers, accepted from them iron and steel at the maximum price; but as a protection to the dealers, the mills paid considerably less for iron delivered by outsiders. The Southern California Edison Company argued that it should be recognized as a dealer because of the thoroughness, etc., with which it had merchandised its salvage business, and the company therefore was taken into the fold of scrap dealers without protest and received for its scrap steel and iron the government's maximum price. During the full period of the government's maximum price of 26 cents on ingot copper, the Southern California Edison Company disposed of all its scrap copper at 25.75 cents, although copper was seldom sold elsewhere above 23 cents. This price was "bulled" by the salvage agent because of the scarcity and high selling price of red brass on the Pacific Coast at that time and also his knowledge that the founder could blend copper at 26 cents with zinc, lead and tin at their respective market values and yet compound ingot brass for even less than scrap red brass was selling for.

Some of the Markets

The exploration of the rubber industry found a market for auto casings at a price of from 8 cents to 15 cents per lb. and for all casings sold in 1918 an average of 11.6 cents was received. The junk trust's offer for auto casings was 5 cents. Inner tubes brought from 22 cents to 30 cents per lb. Discarded linemen's gloves changed hands at $1.00 per pair, with the workmen handling injurious chemicals, such as storage battery electrolite, etc. Lead glass from broken incandescent globes, etc., brought 6.5 cents per lb. Old manila rope, ordinarily priced at 4 cents, brought from 8 cents to 20 cents per lb. One market for this is in the lath mill, where it is unstranded and used to tie lath bundles. The obsolete holophane reflector was put to novel use as a fruit dish or punch bowl and, when mounted on a suitable base, is both appropriate and beautiful. Clear arc light globes were redeemed for more than first cost by a wise Japanese who knew more about hanging gold fish containers than electricity. Frosted and clear globes alike find a fitting finish with the nurseryman for the shelter and propagation of delicate plants. Obsolete marble switchboard slabs are indispensable to the confectioner and mighty handy for the housewife in fancy baking. Scrap leather belting brought from eighty cents to one dollar per lb., a good deal of it being run into tugs and other harness. These are a few reasons why the common practice of carelessly raking up a pile of so-called waste and touching a match to it should not be countenanced.

It frequently happens that the central station finds itself in possession of some particularly slow moving material; for example, junk sheet iron, which there is only an occasional market for. With diplomacy, this material can be gently "handed" to some one dealer manifesting unusual anxiety to purchasing something else, let us say in this case, steel shafting. The price should be stiffened on the shafting and the offer for sale made only contingent on the scrap dealer's taking the sheet iron, and the revenue from the entire sale may be so proportioned as to allow a fair selling price to be recorded for each item. By taking advantage of this practice of making strong stock sell the weak, a clean-up of low grade stuff can be accomplished, even to the point of making the removal of pure rubbish part of the bargain.

No Itemized List Published

The Southern California Edison Company has found by experience that to keep up and issue an itemized list of all its scrap and obsolete stock for sale is a mistake. Such a list stirs up for the salvage agent a lot of lost motion and unproductive correspondence from frazzled machinery dealers and curious, insincere inquirers. The most effective method of reaching buyers, the writer believes, is to constantly sound and spread the simple song, "The Southern California Edison Company has miscellaneous material and equipment for sale." Then in reply to a request for a list of it all, we answer, "We don't supply one, but give us your wants and conditions and they will have our immediate and careful attention." This calls for a "show-down," disclosing the possibility of a sale or not and salvages time. All property is offered subject to prior disposition, as it is, where it is, for cash on or before delivery. No options are permitted and no guaranties as to a machine's completeness or condition are given. The above procedure is derived from experience peculiar to the sale of second-hand machinery and effects the clean close of a sale without an aftermath.

All inactive, surplus, obsolete material and equipment which becomes of no further use in a department or district of the Southern California Edison Company is forwarded to and concentrated in a clearing storehouse. If it is adjudged by a committee of five engineers to be of no further use elsewhere on the system, the chairman of this committee, the commercial engineer of the company, is responsible for its salvage to the best advantage.

A Central Station Clearing House Needed

Before the close of the war the Engineering Committee of the Pacific Coast Section of the National Electric Light Association appointed the writer chairman of a sub-committee on salvage, the purpose of this committee's work being to put in action the surplus and idle equipment of one central station by another, through loan, trade or sale. This idea of joint salvage by company members surely presents worth-while possibilities and to carry out the plan successfully, a central salvage bureau was thought necessary. As this was a war measure, although now in abeyance, it made for greater thrift and in our economical adjustment of things, it should be given renewed attention.

Before the war our country was in a state of drunken prosperity, so much so, that some enterprises thrived notwithstanding that their extravagance and waste were utterly incompatible with legitimate business. The pressure of war retrenchment, however, crushed out those industries honeycombed with waste, and business that has withstood and survived the strain now finds itself toughened by thrift and down to fighting weight.

GETTING ACQUAINTED WITH YOUR COMPANY

BY R. B. MATEER

For a number of years educational opportunities have been tendered to the members of the quasi public utilities, by both the National Electric Light Association and the National Commercial Gas Association. Hand books, printed matter of exceptional interest and comprehensive courses in operation, accounting and salesmanship are offered to the student who desires a good working knowledge of gas and electric practice. The Philadelphia Electric Company has recently added to these opportunities for self-education by providing for its employes a series of lectures covering every phase of that utility's activities, to be given by the various heads of departments.

Unique in its inception, it is believed that the course as planned will not only result in the uplift of the members, but that the talks by the executives and department heads will "clear the mind of the fog caused by listening to the many versions of how the company's business is conducted."

The tentative program consists of twelve lectures, which will be delivered at the Department Branch Meetings of the Section. The talks, which will be followed by discussion, are:

The Company
The Secretary's Office
Getting the Business
The Station
Transmission
The Customer's Installation
The Bills
The Treasurer's Office
The Paymaster
Safety Engineering
The Claim Department
The Executives

It is believed that taking the employe into your confidence—acquainting him with the work of the other departments and setting forth the policies as determined by experienced executives, encourages loyalty to the company and inspires each member with an enthusiasm that is shown not only in his work but in his attitude and when in contact with the consumers. The loyal, enthusiastic member of any corporation is more than an employe—he is a partner and in proportion as his vision is broadened —so does his usefulness to the corporation increase.

CALIFORNIA COOPERATIVE CAMPAIGN PROGRESS

(Extracts from the report of the California Electrical Cooperative Campaign Executive Committee which show the accomplishments of 1918. A summary of the success of the work in spite of difficulties and plans for the future will be given in brief form in the next issue of the Journal of Electricity, together with comments on the work from men of the industry in the West.—The Editor.)

The object of this campaign is Better Electric Service to the Public, and, as the certain result of that service, more profit to individuals and companies in the electrical industry.

In the advance report of the Advisory Committee of California Electrical Cooperative Campaign, the progress of the last year is concretely reviewed:

Formulation of Principles

The basic idea which led to the institution of the campaign was that as the contractor-dealers are the natural salesmen of the industry, they should, as such, have the cooperation of the central stations and of the other branches of the industry in their educational work so that they may become even more effective in creating in the general public a greater desire for more electrical service. This was, in effect, the idea expressed, in turn, by a contractor-dealer, a jobber, and a manufacturer who, by invitation, attended the meetings of the first Commercial Committee of the Pacific Coast Section N. E. L. A.

The Advisory Committee at its first meeting in January, 1918, outlined in some detail the organization and the plans of the campaign and have closely followed that outline during the year. It contained the following statement:

"The Committee, in considering the plan outlined by the Commercial Committee and, also, considering more in detail the things which are to be accomplished, feels that the development of a closer cooperation and understanding between the central station employes and the dealer-contractors and their employes is an essential foundation to future development and educational work. It shall, therefore, be the Committee's object to bring about a better understanding of the duties of the contractor-dealers and of the central stations to each other, and to cause the individuals affiliated with every branch of the electrical industry to have a better knowledge of their proper attitude toward companies and individuals in other branches of the industry.

In answer to several questions that were raised during and after the get-together dinner at San Francisco, the Advisory Committee at their meeting on June 8th framed and adopted the following resolution:

"It is the policy of the Advisory Committee not to ask or urge Central Stations to go out of or to stay out of the business of selling lamps, appliances, etc., at retail to their regular consumers. It is, however, its policy to encourage the Central Stations to conduct their selling of appliances, etc., on an ethical retail basis; on a basis that will encourage the retail dealers of their respective territories to become more active and progressive as electrical retailers and contractors.

And at its meeting in San Francisco on August 2 and 3, 1918, the Advisory Committee adopted a further statement of policy as follows:

"Our policy is to develop our industry by educational methods, encouraging the practice of good ethical business methods and of improved service to the public. It is recognized that the practice of proper accounting, of other good business methods and of good business ethics will result in companies and individuals being able to ask for their goods and service a price that will include a fair profit, and we hold that such exchange of goods, service and ideas for profit is legitimate and ethical, provided that all parties in the exchange, including the customer, are benefited thereby.

It is expected that the adoption of good business methods will also so increase the efficiency of the various branches of the electrical industry serving the public that it will enable our industry to give the customer a better value for the dollar he spends for electrical service."

Some of the Things Accomplished

During the year 1918 the Field Representatives have spent considerable effort in increasing the membership of the Contractor and Dealer Association. New locals have been established at Modesto and Marysville, and now there is a local in practically every section of the state. A special campaign for new members was conducted in Southern California by which the membership there was increased over 50%. During the year, the association has been enlarged by 43 new members. In San Jose the dealers have been formed into a local association and may, in a body, become members of the State Association.

An important phase of the Field Representatives' work has been improving the relations between the managers and employes of the central stations and contractor-dealers. In the course of the year 410 calls have been made on 130 central station offices, the objects of the campaign discussed, and efforts put forth to bring about closer cooperation with the local contractor-dealers. A great many cases were found where an attitude of absolute indifference existed between the central station manager and the contractor-dealers, and some cases where the feeling was very unfriendly. Slight cooperation between these two branches of the industry was in evidence in a few places. In many cases meetings were arranged between them and in nearly every instance great improvement has been made.

In nine towns a feeling of antagonism existed. In five, this feeling has been straightened out and a spirit of cooperation now exists; in three, material improvement has been made, while in the remaining one steps are being taken which it is expected will improve the situation.

Examples of Cooperation

The central station men have, in most cases, been quick to recognize that a greater number of properly equipped and well operated electrical stores are essential to giving the very best service to the public and therefore to building up, to the greatest extent, the use of electric power company service. As a result several central stations have changed their policies with reference to the sale of appliances so that they are now selling on an ethical retail basis and under policies that encourage the dealers to be more active in developing the use of electrical service.

In one case a central station, after years of following a policy under which a dealer could scarcely conduct a retail business, has entirely withdrawn

from the field and is now cooperating with the contractor-dealer in the sale of appliances.

Arrangements have been made whereby twenty-eight contractor-dealers have been privileged to display appliances in the power companies' offices in their towns. In fourteen towns the lighting company is mailing out with its bills, advertising matter for the dealers. In one town the lighting company is working with the dealers in an appliance campaign employing several solicitors. In another town a saleswoman is employed by the dealers and central station to make sales for both. In another the lighting company made a big Christmas display in its office, selling the appliances for the dealers.

The encouragement given to the dealers by these and other similar acts of cooperation is, in no small part, responsible for the great improvement in their merchandising activities indicated in later sections of this report.

Assistance in Merchandising Given to the Contractor-Dealer

In the year's work the Field Representatives have covered the entire territory approximately three times in addition to several extra trips which were made into sections which needed special attention.

The greater portion of their time has been spent in assisting the dealers in improving their business methods. Twelve hundred and fifty calls have been made on 390 dealers. Assistance has been given them in the rearrangement and improvement of their stores, in window decorating, improved selling methods and other assistance as the individual case demanded.

Special effort was put forth in improving the feeling between the dealers themselves as well as between the dealers and the central stations. Numerous cases of unfriendly feeling and several cases of antagonism between dealers were found and the work has effected considerable improvement in the existing conditions.

As evidence of improved cooperation among contractor-dealers, 12 dealers are now engaged in two different house-to-house solicitor campaigns covering seven towns and adjacent territory. In addition to these solicitor campaigns 14 dealers are actively doing house-to-house soliciting.

The work with the dealers has resulted in a greatly increased interest in the retail business, and practically every store in the state shows some degree of improvement.

Dealers Equipped for Increased Appliance Sales

During the year 21 dealers have moved into better stores in better locations. Thirteen dealers have made major improvements in their stores involving extensive remodeling, while 23 have materially improved their stores by entirely rearranging them. Five dealers have rebuilt their show windows and 46 have shown marked improvement in trimming their windows. Twelve new retail stores have been opened during the year and there are six contractors who, although they have no stores, are actively pushing the sales of appliances. As a result of these various improvements these dealers are now in a position to greatly increase their sales of appliances.

Some of the tangible results have been mentioned. Most of these improvements have occurred in the last few months and are the direct result of cumulative efforts put forth during the entire year. A further result of the year's work is that many more dealers are now contemplating various improvements in their stores and selling methods.

Other Accomplishments

The matter of a suitable trade mark for the California Association of Electrical Contractors and Dealers was brought up and discussed at nearly every meeting of the Advisory Committee last year. After a great deal of consideration, in which the committee had the assistance of men familiar with matters of this nature, they voted to lay the matter on the table as reports showed that the funds which would be necessary to make any trade mark of actual value to the association could be used to much better advantage along other lines of greater importance.

Regarding the matter of adequate and uniform system of accounting for the contractor-dealers, the committee has also been active. Arrangements were made to secure copies and complete information of the accounting systems that had been adopted by the National Contractors' Association, but when about to turn these over to the field men it was found that the National Association of Electrical Contractors and Dealers were revising the system. The revision has been completed and the field men will soon be in a position to present to the contractor-dealers the advantage of this system and the desirability for its universal adoption.

The committee is supplying to the contractors and dealers throughout the state suitable blanks on which they are expected to report the electrical appliances sold by them each month. The contractor-dealers are urged to mail these reports to the office of the committee regularly as soon after the first of the month as possible. A summary of all the reports (not giving the dealers' names) is to be made up and forwarded to the central stations covering the territory in which they operate. This will inform the generating companies in a concise manner of the activity of the dealers (collectively) and also of the number and kinds of appliances being placed on their lines.

Advertising

Until after the middle of the year the definite policy covering the advertising work of the campaign was not fully determined and put into operation. It now operates on the basis that the central stations offered to, and do, use a campaign business building advertisements in all or a portion of their regular newspaper space. For their use, copy is prepared of a conservative yet convincing nature and distributed simultaneously throughout the state. At the same time copies of the proposed advertisements are mailed to every contractor-dealer with a request that each one get in touch with the local representative of the central station in his locality and ascertain on what dates and in what publications the various advertisements will appear. They are

further requested to prepare corresponding but more specific advertisements of their own, and to have them appear on approximately the same dates as the more general advertisements of the central stations.

It is suggested that by previous arrangement with the newspapers the dealers' advertisements of specific appliances can appear on the same page as the central stations' copy, thereby increasing the "pulling power" of small inserts which by themselves might net meager returns. Another method is to have the central stations insert appear as an "opening gun" on the first of the week. The dealers' advertisements, giving prices and descriptions of appliances, then take the form of "follow ups" and appear in later editions during the week. With their windows trimmed to display the appliances advertised and their sales people alive to the week's special endeavor, the dealers usually experience a stimulation in the sale of the appliances thus cooperatively exploited.

Although the first of these organized advertising suggestions was not sent out until late in October, the results for November and December were very gratifying. Figures compiled from advertisement clippings in the Advisory Committee's office show that during these two months 11 central stations have used 1388 insertions of campaign copy. This work so stimulated the dealer's activity along these lines that during the same period 252 dealers in 117 different localities have used 1622 separate all-electrical newspaper advertisements.

The advertising work of the campaign has done much in the last few months to inspire the confidence of the contractor-dealers in the central stations' endeavor to make them more important factors in the distribution of electrical appliances. And in addition the direct sales by dealers resulting from their own advertisements have, in many instances, been sufficient to convince them that they should continue to profitably develop their business by this means.

Summary of Accomplishments

The first and foremost of the plans laid down by the Advisory Committee in its January, 1918 meeting was "the development of a closer cooperation and understanding between the central station employes and the contractor-dealers and their employes." Along these lines the Field Representatives, with the assistance of the Advisory Committee, have produced very gratifying results.

During the last year the central stations were shown more than ever before what could be done by the contractor-dealers in cooperative sales campaigns. In localities where this type of work was actively pursued by the dealers under the endorsement of the central stations very gratifying results followed in almost every instance. Through the Campaign activities the contractor-dealers found that the generating companies desire to cooperate and to assist the dealer to succeed. The contractor-dealers in turn, have responded enthusiastically and have improved their methods and equipment so that they are showing their cooperation with the central stations in many ways, but particularly by improved service to the general public.

No small part of the success of the campaign during 1918 was due to the fact that the Advisory Committee employed as field representatives two men of ability who were able to, and did, give personal individual attention to the problems of each individual contractor and dealer. The Campaign not only urged the use of better merchandising and better business methods, but the field men personally assisted each dealer or contractor to adapt the general suggestions to their own individual establishments. Much better results were therefore obtained than are secured by the general educational methods that are used in most association work.

Western Ideas

THE TEDIOUS JOB of preparing a vacation schedule for the salesmen was dispensed with last year by the jobbers of San Francisco by the adoption of a scheme which worked so well that they are thinking of repeating it this year. Instead of slowing up the work of the sales force all through the summer by having at least one, and sometimes more than one, absent all the time, all of the salesmen took their vacations at the same time—the first two weeks of July.

Although the full effects of the plan have not yet been analyzed, it proved so successful in many ways that it will be repeated, and it is also probable that most of the dealers will take their vacations at the same time.

One effect of the plan which was noticed was that during the last two weeks of June, which immediately preceded the vacation period, there was a marked increase in orders. This probably was due in a large measure to the fact that the jobbers sent out post cards to the trade advising them of the plan, and these cards acted as a stimulus and reminder to many of their customers. As the plan was followed by all of the local jobbers, all were on an equality and none gained at the expense of the others during the two weeks vacation period.

UNINTELLIGENT ORDERS sent by telegraph often cause annoying delays and are the cause of a much larger outlay of cost than is imagined. The following history of a telegram as sent by a division office of the Pacific telephone to headquarters is thus reported in the Pacific Telephone Magazine:

A telegram was recently received by the superintendent of supplies from a division office reading as follows:

"Please ship to —— one No. 5 rubber pad, large or normal size."

This looks like a very simple order to the man who wanted the pad, and we desire to thank him for the opinion he has of our ability to fill such an order. We hope that the man who was responsible for that telegram will see this article, read it carefully, and in future make his requests so clear that we will avoid what happened in this particular instance, thereby saving expense and labor which can be put to better use.

The rubber pad was evidently required in a hurry, otherwise it would not have been ordered by telegraph, and we will follow the entire proceeding from the time it occurred until shipment was made:

1. Telegram dictated to the stenographer.
2. Stenographer wrote message on telegraph blank.
3. Stenographer called telegraph operator, gave the message and sent confirming telegram to supply department.
4. Telegraphed to San Francisco.
5. Telegraph operator called supply department.
6. Message taken by stenographer and typed.
7. Message handed to clerk for attention.
8. Clerk could not recall such an item and referred to supply catalogue to see if the item was specified.
9. Clerk passed telegram to superintendent of supplies with notation, "Can you say what is required?"
10. Superintendent of supplies gave it attention but could not recall such an item.
11. Supply department called service clerk, Western Electric Company, to know if Western Electric Company had ever furnished us on a requisition an item known as No. 5 rubber pad.
12. Service man, Western Electric Company, did not think so, but would inquire.
13. Western Electric Company called supply department advising that stock cards did not show the item.
14. Western Electric Company called supply department again, stating that perhaps the telegram was not correctly transcribed and that an installer's mat was required. Supply department stated that installers' mats were not designated by numbers and also that they were made of canvas.
15. Western Electric Company called supply department again to say that perhaps corrugated rubber matting was wanted to be used in front of the power board. Supply department stated that rubber matting was not designated by that number and had not heard that rubber matting was furnished in large or normal sizes.
16. Supply department called engineering department to ascertain if it knew what a No. 5 rubber pad was and for what purpose used.
17. Engineering department called supply department and stated it was not used in outside construction and suggested that it be referred to the equipment engineer.
18. Supply department called equipment engineer, asking the same question, and was told that he had no knowledge of the item but it was possible that the telegram referred to a rubber hot-water bottle and that it might be required for use in the operators' retiring room or sick room.
19. Supply department called traffic department to ascertain if it had any knowledge of a No. 5 rubber pad for use in the operators' retiring room, and was advised that the telegram probably meant hot-water bottle. The foregoing efforts to get the answer proved of no avail, and it was necessary to go to the source for information.
20. Supply department dictated a telegram reading as follows: "Your message yesterday, one No. 5 rubber pad. We can not intelligently place the order. What is a No. 5 rubber pad, and for what purpose used?"
21. Stenographer wrote out telegram.
22. Stenographer called telegraph department and transmitted message.
23. Telegraph operator forwarded to destination.
24. Telegraph operator called the division office and read the message over the phone.
25. Stenographer received message and typed same.
26. Message passed through several hands and finally reached the sender.
27. Sender dictated a reply as follows: "Your telegram July 12th. What we desire is one No. 5 rubber pad listed on page 15 Pulmotor catalogue, Vol. 5, code 'Wallbrike.' It is used in the face mask in connection with the pulmotor."
28. Message telegraphed to San Francisco.
29. Telegraph operator called supply department and gave message to stenographer.
30. Stenographer typed and handed the message to clerk
31. Clerk called Western Electric Company and placed the order for immediate shipment, and it went forward the same day.

Of course, the superintendent of supplies should have known when the first telegram was received, just what to order,—there is no question about that whatever,—but he did not. There are rubber pedal pads for automobiles; rubber heel pads for automobiles; rubber pads for use with time stamps, and many other pads used for different purposes, and had any one of them been purchased and shipped, it would have been returned because it was not what was required.

It can readily be seen that the vital word necessary to order the item was omitted from the first telegram, and had the words "for pulmotor" appeared all this labor and expense would have been avoided. The telegram should have read: "One No. 5 rubber pad for pulmotor, large or normal size."

A computation of what this transaction cost in time and expense to all concerned will prevent any business man from sending over his name a carelessly worded telegram.

DIRECTORY OF THE NATIONAL ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS

(A list of the officers and members of the chief committees of the National Association of Electrical Contractors and Dealers which will prove handy for reference.—The Editor.)

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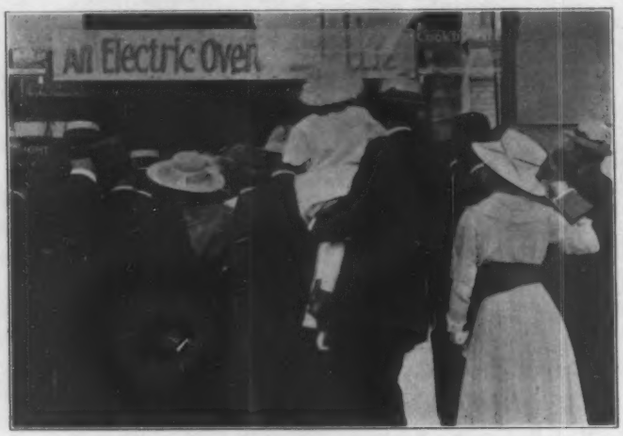
CUSTOMERS' COMMENTS

(Contrary to general impression, perhaps, these articles are not written by members of the Journal staff. The following comments are the result of a shopping expedition undertaken in the last few days by a teacher in one of the smaller California cities. The situation she points out is not connected with the holiday rush, but is one of the everyday problems connected with the electrical dealer.—The Editor.)

Having just returned, somewhat disappointed, from an unsuccessful attempt to purchase an electric toaster and an electric heating-pad, I write this article to the Journal of Electricity, hoping that it may be published by the Journal and that it may be read by the proprietors of the electrical shops at which I have had my experiences. I hope they will take in good part the adverse criticism and will make the necessary changes, because the management in all these shops of which I am writing is in the main so good that a slight improvement is all that is necessary to make things easier for the buyer.

Insufficient Service —

In the first shop, insufficient service was the cause of dissatisfaction to the patrons. Six of us were waiting for attention. The one clerk was so



The window around which the crowd gathers is also one which converts the window gazer into an actual purchaser—that is, provided the interior of the shop lives up to its advertisement.

courteous and so clever in the division of his time that he kept us all amiable, and I am sure that all appreciated his efficiency, but nevertheless four went away without purchasing. One was evidently a prosperous business man, who knew the kind of lamp he wanted and had ready money for the best, but had no time to wait his turn as a purchaser. Another was a boy, too eager for a flashlight to wait calmly even a minute. He pushed his way between a patient, elderly lady and the counter, and then, unable to secure the attention of the one clerk, again shoved the lady aside, and without the longed-for flashlight rushed out, probably to try his luck elsewhere. A third, a man somewhat decrepit and noticeably weary, stood some minutes holding a heating pad that was evidently what he needed and with which he was as evidently pleased, but two young girls were monopolizing the attention of the one handsome young clerk, so the old man laid down the pad and, with a sigh, followed the business man and the vigorous boy. I then decided to seek toasters elsewhere, although the clerk had managed to bring for my inspection one that seemed more satisfactory than any I had seen before. Whether the pretty girls made purchases of sufficient value to compensate for the sales lost, no one except the clerk who had made every possible effort to serve all, will probably know. It is true that the thoughtless girls were the cause of some delay, but the proprietor will, I think, increase his profits by securing the services of an additional clerk or two.

I can almost hear the proprietor's reply, his account of difficulties in securing capable clerks. Fortunately those difficulties are daily becoming fewer. Men will be ready for the positions, and all young women are not thoughtless, indeed the greater number are proving their value. For service in electrical stores, as elsewhere, they can render efficient service.

A Crowded Window —

My criticism of the second store that I passed in my quest for toaster and pad (I say "passed" because I did not enter) is in regard to the display in the window. I think this window presented a sample of every kind of article the store contained. A great variety surely, but so crowded, so poorly arranged that nothing looked worth buying. The window suggested a junk shop rather than one of the best electrical stores, which, I have been informed, I failed to appreciate.

Poor Lighting —

Next I came to a store with a more inviting exterior, but upon entering I immediately became depressed. Coming from the bright and cheery sunshine, I found the dim lighting of the interior was a discouraging contrast. Here the inside dimness had an effect similar to the effect of the crowded window. Nothing looked worth examining. Yet here, dark as it was, there were too many buyers for one clerk, so I had the services of an employe called from the work room. Being without a coat he seemed a little embarrassed, but he knew how to display wares to the best advantage and almost persuaded me to buy an article that really did not meet my entire approval. He would have succeeded, I am sure, had not the dim light made me doubtful of everything there.

Where Customers Congregate —

A few blocks farther on I was attracted by a window surrounded by an admiring crowd. Some admired and passed on, enthusiastically praising as they went. Others went silently on their way, showing keen pleasure however in expression of face and lightness of step. And many went into the shop. Gradually I moved toward the window and when near enough to see the display, I was as pleased as the others. Lamps were there of various kinds, but lamps only, yet greater beauty is rarely presented. Each lamp was so placed that its essential and characteristic value could be clearly seen, and the grouping gave the effect of the enchanted palace that met Psyche's gaze in the magic grove. I gazed with wonder; then followed those who had entered the

store, not because I wanted a lamp, but because this window suggested the perfection of everything within. And truly everything was the kind one wishes to buy, but although the desired articles were there, and buyers eager to secure them, many sales were lost because two clerks could not serve all, and for this reason both store and purchasers suffered.

ADVERTISING ADVERTISEMENTS

BY IRA R. ALEXANDER

(How one of the big department stores set people to reading of their wares by advertising their advertisements, as told in a recent issue of Advertising and Selling. Some of the suggestions here made are applicable to local contractor-dealer advertising campaigns—and are here offered as food for thought.—The Editor.)

Recently the writer visited a friend in a certain Colorado city who is the advertising manager of a large department store, and during the course of our conversation the subject of advertising was touched upon. My friend, whom we shall call Thomas, had ideas of his own relative to advertising, and told of a novel plan he was making use of in giving his firm a worth-while publicity.

"In my advertising I had advertised everything in the store, and finally I began looking around for something new, something a little out of the beaten path," stated Thomas in talking of his work, "and I decided it would be a pretty good plan to advertise our advertisements. I first tried out the method some six months ago and I have made use of it off and on ever since with big results."

At that point I became interested and asked a number of questions, the answering of which brought replies that I am sure will be of interest to other men engaged in giving any line of business publicity. With that idea in view a number of the methods carried out successfully by Thomas are set forth in this article.

"The first thing I did," continued Thomas, "after the idea took hold of me was to get the firm to give me a window and I proceeded to get up a window display of my own—it was an advertisement window.

Posting the Public

"On a large piece of white cardboard I pasted twenty of our advertisements that had appeared in the local newspapers during the past few weeks. On another card I had information that if the people would watch the local newspapers during the next few days they would find out what it was all about.

"On the second day after the ads appeared in the window I devoted our entire advertising space in all the local newspapers to telling the people that the person who wrote the best essay on which was the best advertisement displayed in our window and why, would receive a $20 gold piece. Second and third prizes were also offered.

"The contest ran for ten days, and in our ads all during that period attention was called to our window, and the reason for it explained. Each day large numbers of people gathered in front of the window and the different ads were studied; and that fact alone gave our store and our advertising a lot of worth-while publicity. We received a large number of essays and a good many of them gave us valuable advice that aided in writing future ads and let us know just what the people thought of them. It put us in a position to write better advertisements, and write them more from the people's viewpoint, and in that way we produced ads that attracted more attention. The contest also got the people in the habit of watching our advertisements and they studied them from day to day as they appeared in the papers.

Another Contest

"Two months ago I conducted another contest along similar lines. I let the people know through our advertisements that the person writing the best essay on which of our ads that appeared in the papers during a month's time they considered the best and why would receive a prize. This contest also attracted a lot of notice and secured for us worth-while results, as the people turned to our ad in each issue of the paper and many of them cut them out as they appeared in order to have a complete file from which to write their essays. This, of course, caused the ads to be read thoroughly and many read them that would not have done so had they been run in the ordinary way.

"During the time the contest was in progress an increase in all departments was noted which was credited to the contest.

"At present we are carrying on another little plan which is already meeting with results. We are letting people do a little ad writing of their own. We have a display window down stairs filled with a large assortment of small articles we have on sale here and the people are to study that window and write an advertisement featuring any ten articles in that window that they care to and the person that writes the best ad, and the ads will be judged by disinterested parties, will be given a prize in the shape of $25 in money. We have also made known that the ten best ads will be run in the newspapers in place of our regular ads and the authors' names will be given.

"People come to our window and study the articles therein in order to get material for their advertisements and in looking at the window display many see articles that they are in need of and thus reminded they come into our store and so we have increased our business as a direct result of our contest. We are also paving the way to future business by it.

"There are many ways of advertising advertisements and it is well worth while for a man that is looking for something a little out-of-the-ordinary to follow up. I have found that my ads have a much bigger drawing power since I conceived the idea of giving them publicity."

PORTLAND SIGN ORDINANCE

(Some of the details of new sections of the recent sign ordinance adopted in Portland, Oregon, are here given. They will be of interest to sign men and contractors throughout the West for purposes of comparison with the local regulations under which they work.—The Editor.)

Permits and Fees

It shall be unlawful to maintain, erect, install, repair or reerect any sign in the City of Portland without complying with the provisions of this ordinance relating to signs, and no sign shall be maintained, erected, installed, repaired or reerected in the City of Portland without first securing a permit therefor as provided in this section.

Any person desiring to obtain a sign permit shall file a written application therefor with the Bureau of Buildings, which application shall contain information showing the type of construction, supports, design and location of the sign to be maintained, erected, installed, repaired or reerected, and if it shall appear from such application that such sign will comply with the provisions of this ordinance relating to signs then the Inspector of Buildings shall issue a permit therefor. In case any such sign shall require electric wiring such applicant shall secure an electrical permit and all wiring done under such permit shall in all respects comply with the provisions of Ordinance No. 31793 as amended relating thereto and shall be subject to inspection by the Chief Electrical Inspector.

No sign extending beyond the curb line or suspended over the street between curb lines shall be erected or maintained in the City of Portland without a special permit from the Council.

The fee to be paid for each sign permit shall be fifty (50c) cents.

Construction of Signs

(A) Signs erected in the fire limits, as they are now or may hereafter be extended, shall be constructed entirely of metal not lighter than No. 28 U. S. steel gauge or other non-combustible material. The frame shall be of angles or other steel shapes or galvanized iron not less than 20 U. S. steel gauge and the edges of the sheet metal shall be clinched or riveted and soldered together. In all other respects signs must comply with the requirements of the Building and Electrical Codes in regard to mechanical strength of the various parts and construction methods.

The following limitations are placed upon the use of glass in signs.

Glass in which wire mesh is embedded shall not exceed seven hundred twenty (720) square inches in area or forty-eight (48) inches in any dimension for any piece.

Glass in which wire mesh is not embedded shall not be less than one-quarter (¼) inch in thickness and shall not exceed fifty (50) inches in area for any piece except that letters or numerals made of glass, having surface covered by metal, except the letter or numeral, will be permitted, provided the glass is not more than one hundred forty-four (144) square inches in area for any piece.

Support of Signs

(B) All signs shall be supported from the building with proper metal supports, which, when attached to masonry wall, shall be attached by expansion bolts or shall be built into the masonry or shall be fastened in masonry by anchor bolts set in cement or sulphur or by bolts running through the wall, and shall be laterally secured with guy wires adjustable by means of turnbuckle.

Location of Signs

No horizontal sign shall be erected in such location that the same will, when viewed sixty (60) feet away with the eye of the observer five feet above the sidewalk, blanket another sign eighty (80) feet away of the same dimension and the same distance above the sidewalk. A border not exceeding three (3) inches in width may be blanketed without coming within the scope of this ordinance.

The following table of distances for horizontal signs above the sidewalk and the height of signs shall govern all signs covered by this ordinance.

TABLE

Distance of Lower line of horizontal signs above the sidewalk:	Maximum height of horizontal signs:
10 feet	24 inches
11 "	27 "
12 "	30 "
13 "	33 "
14 "	36 "
15 "	40 "
16 "	44 "
17 "	48 "
18 "	52 "
20 "	54 "
20 "	54 "

No vertical sign shall project beyond the property line more than six feet. The lower line of any vertical sign above the sidewalk shall be not less than fifteen (15) feet.

No horizontal sign shall be erected within twenty (20) feet of another similar sign, measuring from center to center of such sign, when any portion of such horizontal sign is in the same horizontal plane as an adjacent horizontal sign.

Any sign which extends to within twelve (12) inches of the curb shall be at least twelve (12) feet above the sidewalk. Signs which project more than four (4) feet six (6) inches beyond the property line shall be limited in height to four (4) feet six (6) inches unless the lower line of the sign is twenty (20) feet above the sidewalk, in which case the projection shall not exceed ten (10) feet and the projection shall not exceed six (6) feet if the height of the sign is more than ten (10) feet.

All signs shall be so constructed, located and maintained that they will not obstruct the ingress to or egress from windows or fire escapes.

Illumination of Signs

All signs shall be illuminated from dusk to 11:30 p.m. in the inner fire limits, and from dusk until 10:00 p.m. outside the inner fire limits, each day including Sundays.

Electrical illumination shall be provided on both sides of all signs within the inner fire limits amounting to not less than eight (8) candle power or one hundred (100) lumens for each square foot of sign surface, unless within ten feet of a marquise, when one side only may be illuminated, provided illumination on such side is increased by fifty (50) per cent. This illumination must be in the form of incandescent lamps or globes on the surface of the sign to the extent of not less than seventy-five (75) per cent of the minimum candle power required. The balance of the minimum candle power to be installed may be furnished by incandescent lamps in the interior of the sign which afford light by means of prisms, lenses or transparencies.

All letters or characters greater than thirteen (13) inches in height must be outlined by exposed incandescent lamps and at least four lamps must be used in the vertical stroke of each capital letter. Letters from twelve (12) inches in height to seven (7) inches in height must be illuminated by outlining with exposed lamps or by means of prisms, lenses or transparencies. Letters of six (6) inches or less in height may be illuminated.

Illumination shall be provided on both sides of signs outside the inner fire limits amounting to three (3) candle power or thirty-seven (37) lumers per square foot of sign surface. This illumination may be provided either by incandescent lamps on the exterior surface of the sign or in the interior of the sign. For lamps located in the interior, proper lenses, prisms or transparencies shall be provided.

The candle power of lamps used for lighting signs shall be the spherical candle power rating. In cases of lenses,

prisms and transparencies, the assumption shall be that fifty (50) per cent of the candle power of the lamp is lost in passing through the glass, and the candle power of the lamps placed inside the sign for such purposes must therefore be increased to allow for such absorption.

Swinging of Signs

All signs, except marquises as covered in Section 12e, shall be arranged to swing against the building so that the fact of the sign is parallel to the front of the building and when so swung shall not interfere with access to or egress from a fire escape.

Design of Signs

No permit shall be issued for any sign which represents any article or thing which is of a non-artistic nature, or which in itself is unsightly, grotesque, of offensive character or a monstrosity, it being the intent and purpose of this ordinance that all signs constructed over sidewalks shall be attractive in appearance. Any person who feels aggrieved by the refusal of the Inspector of Buildings to issue a permit as herein provided may appeal to the Council for relief from the action of said Inspector.

Use of Marquise for Signs

Nothing in this ordinance shall prevent the use of a marquise for signs. A sign may be placed on a marquise, provided the sign, or face of the marquise, including sign, does not exceed three (3) feet in height and the sign advertises only the name of the building, the name of the owner, lessee or tenant of such building, or the nature of the business, except in the case of a theater or motion picture house when the height of a sign may be not to exceed four (4) feet six (6) inches and may advertise the attraction of the show house. Such theater or motion picture house sign need not be illuminated. Except as herein provided no marquise shall be used for general advertising purposes, nor shall signs other than electrical signs be hung or attached to any marquise.

Maintenance of Signs

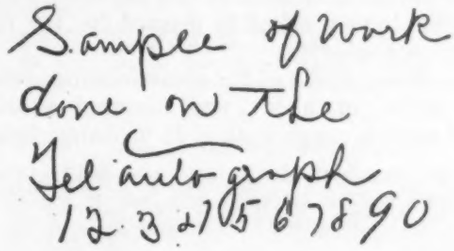
All signs shall be kept in perfect structural condition at all times and shall be subject to inspection by the Bureau of Buildings of the City of Portland; Provided, however, that said City shall in no case be liable for damage caused by the neglect or failure to keep signs in safe condition, but the owner of any sign shall be responsible for all damage caused by the defective condition of such sign, and every person maintaining a sign in the City of Portland shall, upon removal from the premises adjacent to which such sign is maintained, forthwith remove such sign. If it should appear that any sign is becoming unsafe, dirty, dingy or unattractive the Inspector of Buildings shall notify the owner of such sign to put same in a safe condition or to paint or clean the same whenever the occasion shall demand. Any failure or neglect to fully comply with the provisions of this ordinance relating to signs shall be the cause for the revocation of any sign permit granted hereunder.

ANNOUNCING VISITORS ELECTRICALLY

The Telautograph, an electrical device for automatically transmitting messages in writing, is now in operation in the lobby of the Emergency Fleet Corporation's building, and promises to be not only a great time-saver for officials, but a means of preventing strangers, without proper credentials, from wandering into the office floors of the building. The master machine, consisting of a sending, and three receiving machines, is located on the first floor, at the information counter, with connections on each side of the floors above, from which messages may be received or sent. Under this system, when a visitor comes into the building to see an official or employe, he will state his name and business to the operator in the lobby.

Handwriting Reproduced

She will write it on the machine, and at the same time machines on upper floors will reproduce the messages in her handwriting. The second message will be delivered to the person to whom it is addressed, and he will send his reply. If he wishes to see the caller, that fact will be communicated by the machine on his floor to the one on the first floor. The return message is to be stamped by the operator



and will constitute a pass permitting a visitor to enter the elevator.

This is but one use to which the machine can be put. Messages can be written by a person on the first floor and transmitted, in the original handwriting, to persons on any or all of the upper floors.

The writing on the receiving machines is done by an electrically-controlled pencil, which is caused to move on the paper by a variation of electrical current, resulting from movements of the metal pencil on the platen of the master machine.

Connections Easily Made

Connections with the various floors, either individually or in groups, are established by ringing keys similar to those on the telephone switch board.

Thus, the device works very much like a voltmeter, where the needle indicator changes position according to the amount of electrical load passing through. A sample of the work of the Telautograph, which was taken from a machine on the sixth floor, after having been transmitted from the first floor, is reproduced herewith.

FOURTEEN RULES FOR ELECTRICAL CONTRACTING PRACTICE

The following Code of Practice is recommended to architects, consulting engineers, contractors and owners as well as owners' engineers, by the National Association of Electrical Contractors and Dealers, the Executive Committee of which adopted and approved it as a step toward the standardization of many practices in connection with the original contracts and those for extras which, unless definitely settled in advance, leads to misunderstanding on both sides and frequently to controversies and litigation. The National Association does not, however, attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors.

Rule VIII. The contractor shall not be required to cut any work, except his own, and shall not be required to cut, alter or move his own work if due to any cause for which he is not responsible.

THE DIESEL ENGINE ON SHIPBOARD

BY BRUCE LLOYD

(The possible supremacy on the sea which is now open to America is largely dependent on the adoption of the most economical method of transportation available. The success of the Diesel engine as it has actually been tried out on vessels built on the Pacific Coast and the reasons for its slow acceptance are here frankly discussed by the Marine Engineer for the Concrete Section of the Emergency Fleet Corporation. The paper is one of a number which made up a most valuable program at a recent meeting of the San Francisco section of the A. S. M. E.—The Editor.)

The Success of the Steam Engine

In dealing with this subject, which is so diversified in character, it seems almost impossible to begin without paying a tribute to the machine which the ship owner is now asked to discard for the internal combustion engine.

The development of the steam engine, extending over a period of about one hundred years, has reached such a stage that it is probably today the most perfect machine that has ever been produced; its reliability is unquestioned, its economy is high, and it has become so familiar as a prime mover that there is now very little difficulty in procuring operators to handle it successfully. The steam engine is wonderfully smooth running and possesses great flexibility of power, and it is not too much to say that it has now reached the zenith of its perfection.

The motor ship "Nuuanu" which has just made her maiden voyage to the Philippines for the Vegetable Oil Company. She is provided with a 320 h.p. Bolinder engine.

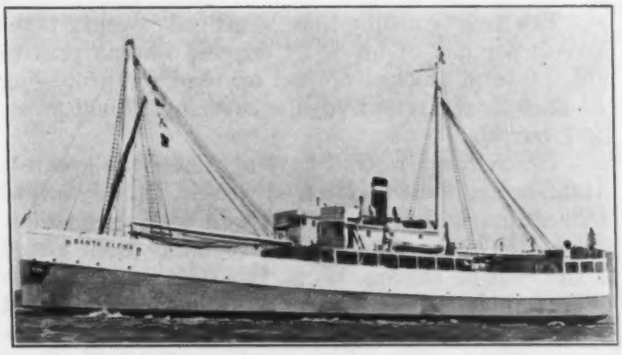
Unfortunately, however, the steam engine is not complete in itself and its future is doomed by its necessary adjunct, the steam generator, which has never been improved to such a degree of economy that it has been received with favor; nor have its attendant dangers and other well known disadvantages been removed, on which account its disappearance is devoutly hoped for by many.

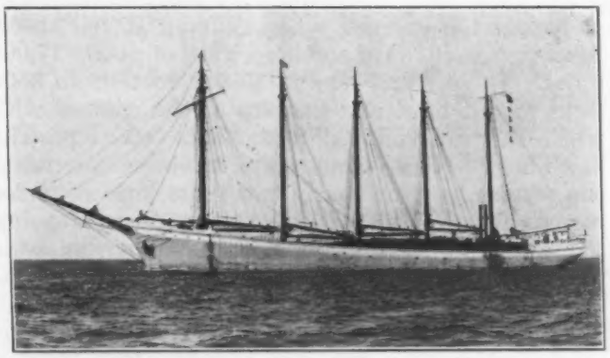
The space occupied by the boiler of a steamship, together with the large amount of room necessary for fuel, is the most obvious and perplexing feature that presents itself to the ship owner who contemplates the construction of a serviceable and economical cargo carrier. Attempts have been made to overcome this objectionable feature by placing the boilers on the upper deck of the ship, which is not so valuable for cargo space, but the fact remains that the boilers are still on board, adding at least their weight, and detracting just so much from the general efficiency of the vessel.

Reasons for Delaying Acceptance of the Diesel Engine

In spite of the fact that the internal combustion engine has overcome this difficulty and given him a tremendous advantage in cargo carrying capacity, the average ship owner has clung to the steam driven vessel with a tenacity equal to that shown by his forefathers in their disinclination to discard the sailing ship and adopt the steamer, and it may be noted here that so strong was this distrust of the steam engine that it is only within the last fifteen years that owners of steam ships were able to overcome their fears that the steam engine might conceivably break down and dependence have to be placed on sails, all ships up to that time being provided with considerable sail area. The history of the application of the steam engine to the propulsion of ships thus shows an exact parallel to the introduction at the present time of the internal combustion engine for the same purpose, auxiliary sail power being still much in evidence in motor ships.

There are, however, besides his abiding faith in the steam engine and his distrust of the internal combustion engine, other and perhaps more weighty reasons which prevent the ship owner from adopting the latter more readily. Until very recently the ports of the world were regulated and equipped to suit the conditions of steamship traffic. Almost every port in the world, no matter how remote from the great centers of shipping, was provided with some facilities for repairing the boilers and engines of the ordinary steamship; neither did they lack the mechanics who possessed the necessary skill to make these repairs and engineers well versed in the operation of a steam engine were always available. Thus, the shipowner when arranging for a voyage to a distant port, secure in his knowledge of the above facts, felt no concern as he knew his vessel would



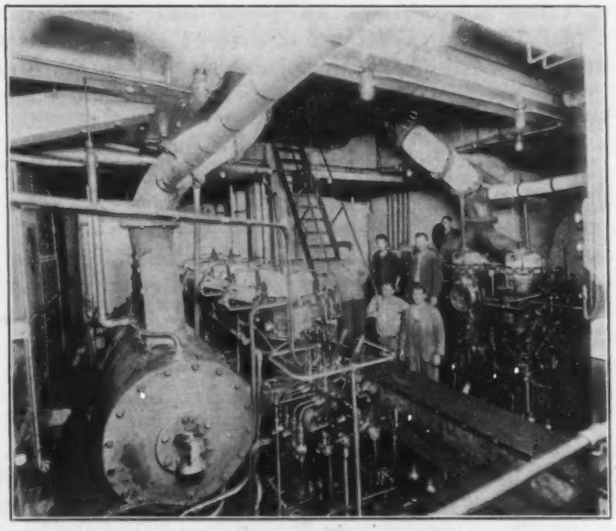


DIESEL ENGINES IN PRACTICE

The motor ship shown on the left is the "Santa Elena" which is one of four similar cargo boats built for W. R. Grace & Company of San Francisco and New York, outfitted with twin 320 b.h.p. engines and capable of 8½ knots speed. This vessel completed a voyage from San Francisco to Payta, S. A., direct in 19 days with about 2000 tons cargo. The vessel on the right is the "City of Portland," a so-called Auxiliary ship equipped with two 320 b.h.p. engines designed for carrying lumber to the east. She has already made two trips to Australia at an average speed of 6.8 knots.

be well taken care of. Up to the present time, however, equal facilities have not been provided for ships whose motive power is the fuel oil engine, although this fault is gradually being overcome.

Another thing which served to retard the development of the fuel oil engine was the fact that European shipowners who controlled the bulk of the world's shipping, were, with the exception of those in Scandinavian countries, to some extent interested



The boiler room of the "Sierra," showing the Diesel engines installed. The great saving is in the doing away with the cumbersome boiler.

in the coal industry and they were also afraid that, should they become dependent on oil for fuel, the price would considerably advance and the supply prove inadequate.

The attitude of the shipowner toward the internal combustion engine has also been influenced to some degree by his advisers, the naval architect and superintending engineer, many of whom have not taken up the study of this particular branch of engineering and who even look askance at it. These men would naturally hesitate to advise the equipment of a ship with machinery which is unfamiliar to them; nor would they be willing to assume the responsibility of superintending the installation of this machinery—afraid of encountering the difficulties which they might personally be unable to overcome.

The war has, of course, considerably delayed the more general adoption of the fuel oil engine owing to the imperative demand that has arisen for ships driven by machinery to which the shipping world is entirely accustomed and for which there was a plentiful supply of skilled operators.

The Reliability of the Internal Combustion Engine

The foregoing, I believe, are the principal reasons for the antagonistic attitude of shipowners toward the fuel oil engine, which attitude is now rapidly being overcome. The reliability of the internal combustion engine is now proved absolutely beyond question when the engine selected is of well known design and constructed by a builder of long experience and established reputation—the installation carefully made in a well constructed hull, with a proper appreciation of the class of cargo that is to be carried. The owner who is swayed by a desire for cheapness either in the purchase of the engine or the installation on the ship will get just what he paid for and the general reputation of the engine will have suffered accordingly.

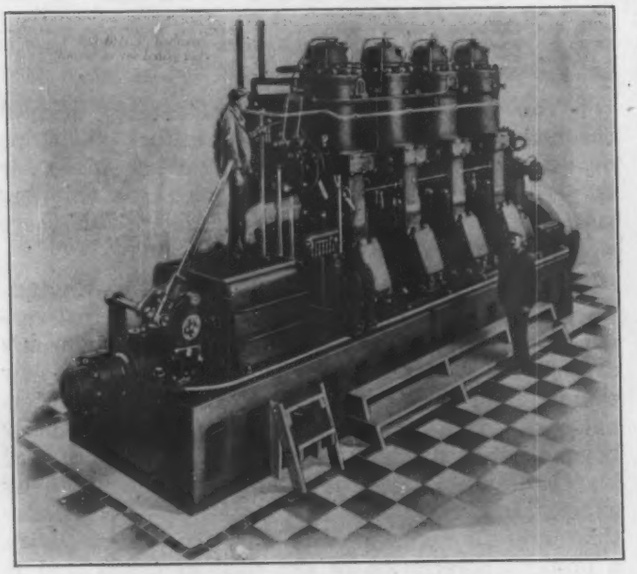
The experience of the writer has been almost entirely with the Bolinder Crude Oil Engine, manufactured by the firm of Messrs. J. & C. Bolinders, Sweden. This engine is of the direct reversible type and has been especially designed for full powered sea-going vessels. There are no cam shafts or intricate gearing; all pumps, etc., being driven off eccentric on the crank shaft; a small compressor driven off the forward end of the crank shaft supplies air for pulverizing the fuel on entering the cylinder; the reversal of the engine's direction of rotation is affected by pre-ignition, maneuvering in a method similar to that of the steam engine. These engines are manufactured in 2 and 4 cylinder sizes up to 1000 b.h.p.

The Diesel Engine in Use

During the past two and one-half years sixteen vessels owned and operated on the Pacific Coast have been equipped with these engines for motive power, ten of these being what is termed Auxiliary ships, in which the sail power is intended to predominate. All of them are engaged in overseas trade to distant ports, where fuel is either not available or procurable only at almost prohibitive rates. Fuel tankage had therefore to be provided of sufficient capacity

to supply the engines, when running at full speed, for a voyage outward and homeward of nearly 17,000 miles. These ships vary in size from 1500 to 3500 dead weight tons, and the size of the engines with which they are equipped, from 320 to 600 b.h.p. The machinery of these motor ships has been in continuous service now for nearly two years, operating for periods from 35 to 50 days without once stopping the engine, with the exception of minor mishaps which have occurred only in the first two installations.

Space will not permit reference to the performance of more than one ship of each type.



A 500 b.h.p. Bolinder engine on the testing bed

The first large Auxiliary ship, equipped with "Bolinder" engines on the Pacific Coast, was the motor ship "City of Portland," one of the three sister ships built and owned by the McCormick Steamship Company of San Francisco. These vessels are approximately 3500 deadweight tons and are able to carry more than 2,000,000 feet of lumber. They are equipped with twin engines of 320 b.h.p. each and have as auxiliary machinery for electric light purposes two 8 b.h.p. stationary engines of the same manufacture as the main engines, directly connected to 5 kw. generators. The "City of Portland" has made two voyages to Australia, carrying lumber on the outward voyage and returning with large cargoes of copra collected at different islands in the Pacific. She has made voyages to the eastern coast of the United States, via the Panama Canal, and has now just completed a voyage from Astoria to Shanghai which occupied 34 days. The engines have run continuously, often making runs of 45 days without any stoppage of the machinery. The average speed maintained to Australia was 6.8 knots. During the voyage to Portland, Maine, from San Francisco, and to Shanghai from Astoria, the engines were allowed to develop their full power, and the speed averaged 7.5 knots per hour. The sails were of practically no use on any of these voyages, and these vessels should be properly designated as low powered motor ships.

The fuel consumption averaged twenty-three barrels per day of oil of 24 degrees Baume gravity and the total amount of fuel oil used for propelling the ship on the round voyage covering 17,000 miles, 1997 barrels.

The motorships that have attracted the greatest attention are the full powered vessels, as they afford the best opportunity of comparison with steamships, and of these the four that have lately been added to the fleet of Messrs. W. R. Grace & Co. are excellent examples of the possibilities of modern sized ships equipped with fuel oil engines. These ships are the "Santa Elena," "Santa Isabel," "Santa Cristina" and "Santa Flavia," and their dimensions are as follows: Length 205 feet, breadth 42 feet, depth 29 feet, cargo capacity about 2,000 tons on 18 ft. 6 in. draft. The propelling machinery of each ship consists of two 320 b.h.p "Bolinder" engines (twin screw). The main fuel supply is carried in steel tanks, having a total capacity of 1770 barrels, sufficient for nearly 75 days running, and the extensive radius over which they are able to travel without having to stop for refueling gives them an immense advantage over the ordinary steamer, to which may be added the cargo space obtained by the elimination of the boiler space. All of these vessels have completed voyages to New York via Valparaiso, calling at other South American ports and the Panama Canal, covering a distance of over 14,000 miles, at an average speed of 180 knots per day. There were no detentions at sea, and none at any port on account of repairs to engines.

Load displacement of the above motorships is approximately	**3850 tons**
Weight of hull and equipment	1700 "
Weight of machinery	64 "
Weight of fuel oil necessary for voyage of 70 days	240 "
Water	12 "
Stores	8 "
Cargo capacity	1826 "

Load displacement of steamships with reciprocating engines of approximately	**3850 tons**
Weight of hull and equipment	1700 "
Weight of machinery	150 "
Fuel oil for 70 days' steaming	630 "
Water	60 "
Stores	8 "
Cargo capacity	1302 "

Meeting Difficulties in Operation

Of the problems that appeared at first, the most disturbing was the lack of skilled operators, but in a surprisingly short time it was found that the local engineers were able to thoroughly understand and operate this type of engine, and there is now very little difficulty in obtaining engineers, who although previously with the marine steam engine, are now competent to undertake long voyages in motorships, which has been fully proved by the records of voyages mentioned.

The engine troubles have been confined almost entirely to cracked cylinder heads and broken compressor shafts. The fracturing of the cylinder heads it was noted always occurred while maneuvering the engine in entering or leaving port, and never at sea while under way. It was discovered that this was caused by the overheating of the head, through the cutting off of the water cooling supply when the engine stopped, the circulating pump being driven off the main crankshaft, and the sudden cooling and contraction which took place when the engine started

again forcing the water through the head. This trouble has been entirely eliminated by devising means to keep a constant circulation of water through the cylinder heads while the engine is at rest.

The breaking of the compressor shaft which occurred in the first three installations only, was due to a mistake in the design which was quickly and easily rectified, and there has never been a recurrence of this trouble.

The Field for the Diesel Engine

It is not intended in this paper to advocate the internal combustion engine for passenger ships, or for vessels carrying highly valuable cargoes, such as silk or refrigerated products which on account of the large amount of capital invested and the extremely high rate of insurance, must be transported within the shortest possible time; this necessity for speed relegates the question of economy to a place of secondary importance, as such cargoes must be carried in large ships of high power, which is not possible at the present time, having regard to the development of the oil engine.

We take it for granted that merchant ships and steamers are operated for the purpose of profit, or carrying cargo at a minimum cost; therefore the hull that can carry the most cargo at the lowest cost—at the usual tramp speed—at about an equal outlay of capital, is the most economical. Trans-Pacific trade is the one that this coast is most seriously interested in. Developing and extending the export and import business with Australia, the Orient and South America, should be the particular endeavor of our Pacific Coast merchants and shipping companies, and to handle overseas goods and products, tonnage is absolutely necessary. On account of the distances, difficulty has been experienced in finding economical ships. An ordinary tramp steamer of 5000 deadweight tons inclusive of bunkers, on some voyages can carry only 3000 to 4000 tons actual freight paying cargoes, on account of the space taken up by bunkers or weight of fuel oil. A steel motorship of 3500 deadweight tons, 9 knots speed, carries on a direct voyage of 8000 to 10,000 knots, nearly as much revenue producing cargo (at a greatly reduced cost of operation) as a steel steamer of 5000 tons deadweight of the same speed, viz:

Motorship, d.w. tons	3500	Steamship, d.w. tons	500
Fuel oil engines:		Steam engines:	
Oil fuel for 45 days running at 5 tons per day	225	Coal fuel, 45 days at 25 tons per day	1125
Water for boiler	None	Water for boiler	100
	225 tons		1225 tons
Net paying cargo	3275 "	Net paying cargo	3875 "

At the close of the Civil War, the control of the world's shipping passed from America to England, one of the principal causes being the efficiency of the steel ship. There is every indication that this control will return to America. It can only be firmly retained if the American shipowner will take advantage of his present position and his relation to the fuel oil supply, and adopt the internal combustion engine.

HYDROELECTRIC ENERGY AND THE ELIMINATION OF WASTE

The following extract from an article by John P. Young, which appeared in the San Francisco Chronicle, ably points out some of the elements in the elimination-of-waste campaign which especially appeal to Westerners:

In a publication called "Fuel Facts," which has gone into a second edition, the United States Fuel Administration pointed out the condition which was entailing so much suffering during the very severe winter of 1917-18 was not a temporary one, although intensified by the extraordinary demands made upon railroad and other carriers by the necessity of moving vast quantities of material and great numbers of men to the other side of the Atlantic.

As a temporary measure of relief, it will be remembered, factories operating within a prescribed zone were forbidden to make extensions so that there would be no further encroachment on the supply of coal required to keep the people from freezing. Even with this restriction the situation was not sufficiently relieved to permit consumers to draw freely upon coal dealers and the population was practically put on rations.

The appearance of a second edition of "Fuel Facts" indicates that the cessation of hostilities has not been taken as a signal that precautions may be relaxed. On the contrary it distinctly conveys the impression that economy in the use of fuel must be practiced. It is filled with directions to the consumer how to save coal, all of which, doubtless, have the effect of reducing wastefulness, but it is clearly apparent that this excellent advice, combined with the deterrent effect of extremely high prices, will not do more than reduce the hardships the condition imposes, and therefore it cannot inspire any hope of future relief.

That this cannot be looked for, and that the condition is not a temporary one, is made clear by the statement that the population of the congested region is growing at an alarmingly rapid rate. A table prepared by the Provost Marshal-General in connection with the draft law shows that millions of people, all consumers of coal, are annually being added to the populations of the congested regions. Of course, the needs of these added millions greatly exceed the extraordinary demand for fuel occasioned by the war, and they will not cease with its cessation.

It is obvious that sifting the ashes with care, or unremitting attention to the damper, cannot remedy the matter. While the waste is being stopped at the spigot it is going on without interruption at the bung. The necessity of getting coal and raw materials to the factories of the East to keep them in operation, and to transport the foodstuffs consumed by the dense populations, implies immeasurably greater wastefulness. It accounts for nearly half of the almost 200,000,000 tons of coal annually burned by locomotives drawing the trains to distant points of consumption and in hauling the goods manufactured in those regions back to localities whence the raw materials and the fuel required to turn them into consumable goods were derived.

"Fuel Facts" in a circuitous fashion suggests that hydro-electric energy may ultimately play a great part, but it is too timid to dwell on the necessity which will soon confront manufacturers in the congested regions of abandoning those parts of the world in which the cost of production is becoming prohibitive for places where power can be obtained in abundance and cheaply, and where the raw materials required to utilize power can be produced. When the Washington bureaus rise to the desirability of removing all trammels from the development of hydro-electric energy they will be able to talk about the elimination of waste to some purpose.

NEW CHARTS FOR AERIAL SUSPENSIONS

BY JOSEPH N. LE CONTE

(The computation of sag constants in aerial design has proven an intricate yet important problem in the evolution of long distance transmission in the West. Here is a new method for accurately ascertaining this important information by means of charts. The writer is professor of engineering mechanics at the University of California. This article is abstracted from a paper delivered before a recent meeting of the San Francisco Section, A. I. E. E.—The Editor.)

Numerical computations involving the Catenary Curve are rendered troublesome by reason of the transcendental form in which the equation of the curve appears. This makes an exact algebraic solution impossible, and we must resort to either a more or less approximate algebraic solution, a solution by reference to tables or graphs, or a graphical construction. The first of these methods is usually based upon the parabolic approximation, and becomes more nearly exact as the catenary becomes

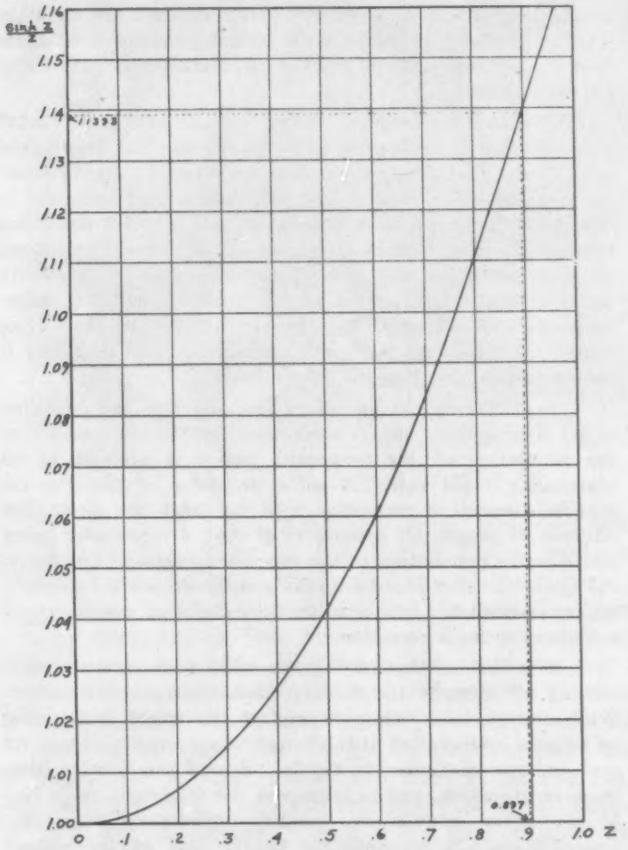


Plate I—A useful curve for the location of the lowest point in a suspension and the determination of the tension, or for the determination of the horizontal distance between supports and the location of the lowest point in a suspension. This is the problem which may arise in steel tape measurement.

flatter, that is more tensely drawn up, but will not apply with sufficient exactness to a slack span. The last method requires a new construction for each case, and is troublesome. It is by the second method, by reference to tables and to plotted graphs, that the following solutions are accomplished. An attempt is made here to solve all cases as far as possible by algebraic equations. When this is impossible, reference to tables and curves must be resorted to.

In regard to these latter it should be noted that, for the convenience of the computer, all graphical constructions are eliminated, and standard reference curves alone are used for the solution of equations. The following ideas have been kept in view. First, a very few curve sheets are made to cover all cases. This requirement has been met in the present instance by two such curve sheets. Second, the curves used should be single curves, i. e. one to each sheet, this one to cover all cases for which designed. This has been realized in all cases of the horizontal catenary (the catenary with supports at equal heights), and in all but one case of the general form, this last necessitating the set or "family" of curves shown in Plate II.

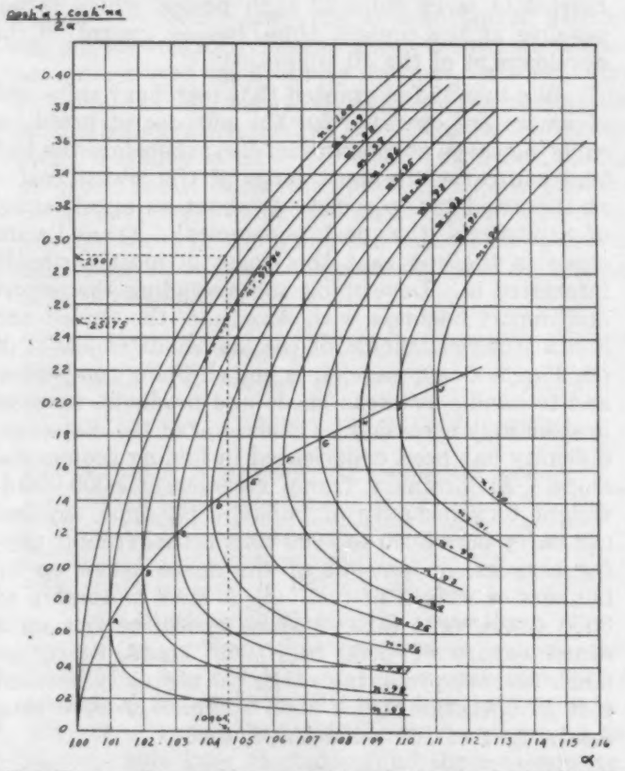


Plate II—A useful curve for ascertaining the length of wire between supports and the location of the lowest point in a suspension. Here we have the problem of determining the form, where the cable is drawn up to a known tension between given points of support.

It should especially be noted that all which follows applies to the mathematical catenary only, that is to say to the curve assumed by a cord or wire hanging between fixed supports, acted upon by gravity only, of uniform weight per unit of length, perfectly flexible as regards bending stresses, and perfectly rigid as regards tensile stresses. Due to the elastic nature of the materials of construction, an actual wire or cable does not satisfy these conditions exactly, in other words the length of the wire as hanging between supports, will not be the same as when lying unstressed on the ground, neither will

it hang up a true catenary. The mathematical catenary is, however, the basis of all preliminary calculation, and it is of this entirely that the following treats. Again, it must be remembered that in the cases of tight spans we are dealing with very large numerical quantities, and as the final solution involves the differences of large and nearly equal numbers, the calculation must be carried through with a high degree of refinement to insure even approximate accuracy. The curves shown on the two plates must be drawn with great accuracy and to a large scale. The samples shown on the printed pages can only give approximate results, neither is Plate II carried through sufficient range to cover all cases that might occur in practice. The computer should draw his own curves from the equations which follow. The numerical problems worked out in connection with the present discussion make use of curves plotted on paper having 1 inch main divisions, corresponding to the coordinate lines on the printed pages. These are further subdivided by ruling to 1/10 inch spacing. Plate I will then be about 13 x 22 inches, and Plate II if made in two parts overlapping on the same sheet, will be about 18 x 22 inches.

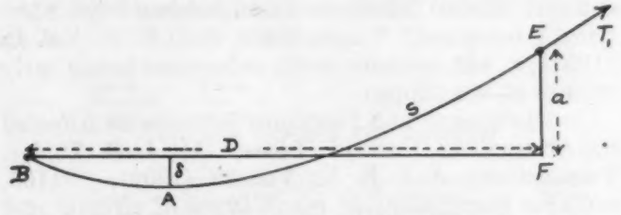


Fig. 1—The graphical relationship from which mathematical equations are deduced in sag formulas

In the practical solution of the catenary the quantities entering are:

D, the horizontal distance in feet between supports
a, the difference in level in feet between supports
s, the total length of the wire in feet between supports
T_1, the (larger) tension in pounds at the upper support
w, the weight per foot of the material assumed to be uniform
δ, the deflection in feet at the lowest point A below the lower support.
This point may lie between supports as in Fig. 1, or on the prolongation of the curve beyond the lower support.

The three important cases that arise are:

I. Given D, a, and s, to find T_1 and the location of the lowest point A. This is evidently the problem of determining the form in which a given piece of material will hang between known points of support.

II. Given a, s, and T_1, to find D and the location of A. This is the problem which may arise in steel tape measurement.

III. Given D, a, and T_1, to find s and the location of A. Here we have the problem of determining the form, when the cable is drawn up to a known tension between given points of support.

In all the above cases the weight per foot of the material, i. e. w, is assumed as known and as constant throughout.

In order to deduce the equations that are here employed a knowledge of the relations of the hyperbolic functions is necessary, but such knowledge is not essential in order to use the curves and make the actual computations. The hyperbolic functions are used instead of the ordinary exponential functions for the reason that they are more easily transformed and combined. A complete table of such functions is therefore necessary if the equations are to be computed by the methods which follow. A table sufficiently exact will be found among Smithsonian Mathematical tables[1].

The general relations between the various quantities are as follows. Refer the catenary curve to a set of rectangular coordinates, the axis Y being vertical, and through the lowest point of the curve, the axis X horizontal and at a distance C below the lowest point. This choice of origin O below the curve is made necessary by the form in which the equation appears, and the occurrence of this quantity C is one of the most troublesome features of the analysis.

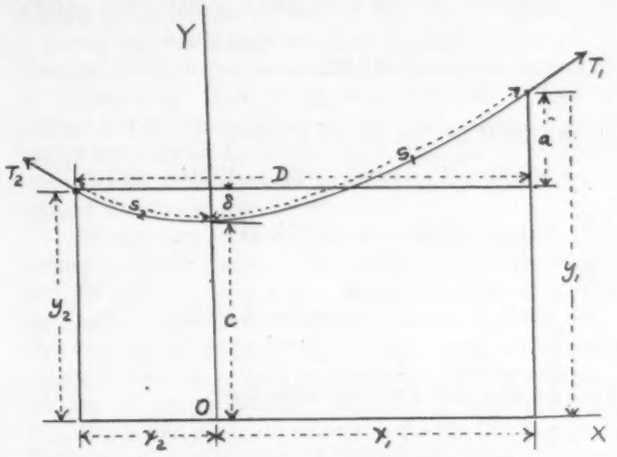


Fig. 2—The general graphical relationship of constants involved in suspension design as discussed in this article

Case I.—From the principles of mechanics we establish the relationship:

$$\frac{\sinh Z}{Z} = \frac{\sqrt{s^2 - a^2}}{D}$$

Although the right side of this equation is known, the equation cannot be solved for Z, due to its transcendental form, but it can be solved by a single curve, for the left side is a pure function of Z. We may draw a curve then as in Plate I whose abscissas are Z and ordinates $\frac{\sinh Z}{Z}$, and for any known value of the latter the former can be picked off. As soon as Z is known, $C = \frac{D}{2Z}$ is known, and then K can be computed from the relationship—

$$\frac{K}{2C} = \sinh^{-1} \frac{a}{\sqrt{s^2 - a^2}}$$

which can be found by direct reference to the tables of hyperbolic functions. It will be noted also that if a is small compared with s, so that $\sinh \frac{K}{2C}$ is

[1] "Hyperbolic Functions," by Geo. F. Becker and C. E. Van Orstrand, 1909. Published by the Smithsonian Institute, Washington, D. C.

small, then will $\sinh \frac{K}{2C} = \frac{K}{2C}$ nearly. Knowing K, and D, x_1 and x_2 can now be computed, and then y_1 and y_2 are obtained from $y_1 = c \cosh \frac{x_1}{c}$, etc., by means of the tables. Finally, $T_1 = wy_1$, $T_2 = wy_2$, $s_1 = \sqrt{y_1^2 - c^2}$, $s_2 = \sqrt{y_2^2 - c^2}$, $S = s_1 + s_2$. If the two supports are of equal height $a = O$, $K = O$, $\frac{\sinh Z}{Z} = \frac{S}{D}$, etc.

Case I—Example: Consider a span of copper wire, size oo, where $w = 0.4028$ lbs. per foot. Let $D = 500$ feet, $a = 20$ feet, and $s = 570$ feet. Then:

$$\frac{\sqrt{s^2 - a^2}}{D} = 1.1393 = \frac{\sinh Z}{Z}$$

from which by the aid of Plate I,

$$Z = 0.897 \quad 2Z = 1.794$$

$$C = \frac{D}{2Z} = 278.71$$

$$\sinh \frac{K}{2C} = \frac{a}{\sqrt{s^2 - a^2}} = .035109$$

This is so small that we may say

$$\frac{K}{2C} = .035109$$

So that $K = 19.570$ ft. $= x_1 - y_2$
But $D = 500$ ft. $= x_1 + x_2$
Hence $x_1 = 259.78$ ft. $x_2 = 240.22$ ft.

$$y_1 = C \cosh \frac{x_1}{C} = 408.80 \text{ ft.}$$

$$y_2 = C \cosh \frac{x_2}{C} = 388.80 \text{ ft.}$$

$a = y_1 - y_2 = 20.00$ ft. (check)
$T_1 = wy_1 = 164.6$ lbs. $T_2 = wy_2 = 156.6$ lbs.
$\delta = y_2 - C = 110.09$ ft.

PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(A brief bibliography on the subject of Inductive Interference, compiled by a man who was closely associated with the work of the California Inductive Interference Committee and is in intimate touch with the subject. The article is the concluding one of a series which has been running through the Journal of Electricity covering the fundamental principles of this subject.—The Editor.)

Literature of the Subject

The great interest shown in inductive interference matters during the last few years has given rise to numerous published discussions. It is proposed here to mention a few of the later and more important ones, which afford the readiest means of acquiring familiarity with the present status. The series of brief discussions of which the present writing forms the conclusion have aimed to provide the background of elementary facts, to make easier the understanding of more elaborate treatments.

Unquestionably the most complete study of inductive interference now available is the work of the California Joint Committee on Inductive Interference. The first report of that body to the California Railroad Commission was published in the Transactions, A. I. E. E., Vol. 33, p. 1441 .(1914).* The final report of the committee has just been published by the California Commission, and may be had from them in pamphlet form.† This report gives the results of the Committee's five years of study, with its conclusions and recommendations.

The technical studies of the California Joint Committee are very soon to be published in a volume of about 1000 pages, containing much valuable data. A fuller description of its scope is given in the Proceedings, A. I. E. E., Feb., 1918, p. 31, and Journal of Electricity, Dec. 15, 1917. It will contain the reports of the Joint Committee to the California Railroad Commission and the general order resulting therefrom. The final report is commended to all interested, and the larger technical volume, to those who wish to study the problem in more detail.

An interesting paper by George D. Shepardson entitled "Some Telephone Disturbances from Electrical Generators," Transactions, A. I. E. E., Vol. 15 (1898), p. 443, contains many references to the early studies of the subject.

"Telegraph and Telephone Systems as Affected by Alternating Current Lines," by J. B. Taylor, Transactions, A. I. E. E., Vol. 28 (1909), p. 1169, contains descriptions of many types of circuits and other data of fundamental interest.

"Inductive Interference as a Practical Problem," by A. H. Griswold and R. W. Mastick, Transactions, A. I. E. E., Vol. 35 (1916), reviews the case of transmission lines paralleling telephone lines, giving examples and suggestions for study of particular parallels.

A comprehensive treatment of the latest method of transposition of telephone lines, with reference to power circuits, is given by H. S. Osborne in the July, 1918, Proceedings, A. I. E. E.

"Inductive Effects of Alternating Current Railroads on Communication Circuits" are very helpfully discussed in the August, 1918, Proceedings, A. I. E. E., by H. S. Warren. Very interesting instances of the experience with such electrifications are given.

The two papers last mentioned have also appeared in the "Telephone Engineer." Many additional references may be found in the bibliography given in the Final Report of the California Joint Committee, already mentioned.

TELEPHONES THE WORLD OVER

The United States had 22,137,479 miles of telephone wire to 11,800,240 miles in all of Europe and its business has been extended since that time at a far greater rate. All of South America contented itself with 449,588 miles, while Africa had but 188,380 miles and Asia not much more in proportion to its size with 759,326 miles.

†See Journal of Electricity, Dec. 1, 1917, for summary.
*See Journal of Electricity, Sept. 12, 1914.

WEIGHTS AND MEASURES OF LATIN AMERICA

BY FREDERICK A. HALSEY

(The man who is selling to South America or looking toward that field of trade will be interested in learning the extent to which the metric system is there prevalent and the demand for articles manufactured to that measure. The following is an extract from the report of the American Institute of Weights and Measures as it was presented before the annual convention of the A. S. M. E. and resolves itself into an argument against the adoption of the metric system. Without necessarily subscribing to this standpoint, it is here presented for the interest of our readers. The author is Commissioner of the American Institute of Weights and Measures.—The Editor.)

The inquiry of this paper is a portion of the report made to the A. S. M. E. at their annual meeting and was conducted through a questionnaire of which about 500 copies were distributed throughout South and Central America and the West Indies. The information given herein is not, however, limited to that obtained through the questionnaires as various citations in the text point out. In all cases, quotations without names attached are from the questionnaires.

Spanish and Portuguese Weights and Measures

As many readers are not acquainted with Spanish weights and measures, tables of the more common units and their relations are here given. The translation of the names is almost self-apparent, but the following are given:

Onza	Ounce	Pulgada	Inch
Libra	Pound	Pie	Foot
Tonelala	Ton	Vara	Yard
Cuartillo	Quart		

SPANISH WEIGHTS AND MEASURES

Weight		Dry Measure	
16 onzas	= 1 libra	4 cuartillos	= 1 celemin
25 libras	= 1 arroba	12 celemins	= 1 fanega
4 arrobas	= 1 quintal	12 fanegas	= 1 cahiz
20 quintales	= 1 tonelada		
Liquid Measure		**Length**	
4 cuartillos	= 1 azumbre	12 pulgadas	= 1 pie
8 azumbres	= 1 cantara	3 pies	= 1 vara
16 cantaras	= 1 moyo		

Unification of English and Spanish Weights and Measures

With slight differences in the values of the units, this system is substantially identical with our own. With suitable foresight and effort the two might have been unified long ago.

The chief difficulty in the adoption of the metric system in Latin America has been and is the psychological difficulty—that is, learning to think or visualize values in strange units. In this sense the difficulty of adopting the English values of the units would have been nil for there would have been little change in values to cause confusion of thought, while in names there would have been none. Meanwhile the still greater difficulty in our own case—the physical difficulty due to the anchorage of units in standardized manufacture — was and is absent in Latin America where but little manufacturing is done. The difficulties in the way of adopting the English values of the units thus were and are trifling in comparison with those in the way of adopting the metric units. The remaining question is: Is it too late? Except for units for land measure, which, once established, should be let alone, I think not, for conditions have not materially changed in Latin America. It must be apparent there, as this inquiry makes it here, that the attempt to adopt the metric system is a failure. The weights and measures of Latin America are in a state of chaos, for which a remedy is sorely needed.

General Analysis of Results

The effort to learn the relative usage of the different systems has not been successful. When one return gives exclusive use of the metric system for a given purpose and another exclusive use of the Spanish system for the same purpose, discrimination is impossible. The thing here proven is that the claim that Latin America is metric is false, as are all arguments based upon it. In particular it should be noted that the order in which the units are herein named has no significance.

In but one of the countries investigated (Uruguay) can the metric system be said to be adopted for domestic trade, while there we find an authorized official exception in the case of real estate, as we find other exceptions in the cases of wearing apparel, industry, and navigation. Nevertheless, in twelve of these twenty countries, according to a report on The Metric System in Export Trade by the Director of the Bureau of Standards, the metric system is "obligatory."

In ten of these countries (apart from the railroads and other fields under immediate government control) the metric system has made almost no impression. (Nicaragua, Guatemala, Spanish Honduras, Cuba, Panama, Colombia, Porto Rico, San Salvador, Ecuador, and Costa Rica.)

Of these ten countries, according to the above report, the metric system is "obligatory" in seven. In five of them (Cuba, Colombia, Porto Rico, Panama, and Spanish Honduras) the English units are used far more than the metric, having largely supplanted all others, although in three of them, according to this same report, the metric system is "obligatory." Not only has the English pound come into large use, but the arroba and quintal have been adjusted in value to make them equal to 25 and 100 English pounds, respectively. In substantially all of the countries investigated the English inch is used for navigation and sea shipments. That most derided of English units—the nautical mile—is used by all countries that sail the seas and they use no other. The kilometer is an unknown measure at sea.

The farther we get from the field of retail trade, the less is the system used. In this field the progress is chiefly with units of weight and capacity, the measure of length for the sale of dry goods being commonly the vara, while imported wearing apparel of all kinds is commonly sold by the units of the country of its origin, by the inch at least as much as the centimeter, and domestic products are frequently made to numbered sizes, of which the relation to any

system of units is not apparent. They are not metric.

In primary or wholesale markets the old measures prevail, although these, in some cases, have been adjusted in value to make them even multiples of English basic units. We have here perfect examples of the simple process of unification of English and Spanish measures which, with proper encouragement, might by this time have become substantially universal.

Lumber and timber are almost universally sawn to the inch, although frequently mixed with the vara or the meter for length, and the square and cubic meter as sales units, prices being made at so much per square or cubic meter for one-inch boards.

In the mechanical trades tailors and seamstresses use all three systems, as do stone and brick masons, while carpenters commonly use the pulgada or inch. In machine shops both English and metric units are used, depending chiefly on the country of origin of the machines they have to repair. The inch is predominant.

In this connection we have the report of the Cleveland Twist Drill Company that shipments of their tools to South America are "95 per cent to 100 per cent English," and of the Detroit Twist Drill Company that "All of our South American customers use more English sizes than metric." Needless to say, English-sized twist drills are bought in order to make English-sized holes, for they will make no other.

In ship and boat building, also, the English units find large use, while in mining and smelting we find a miscellaneous mixture of all three systems.

The persistence of old units is most pronounced in the measurement of land. When units of measure are once anchored in titles to real estate, they are there to stay. Of this we have perfect examples in the use of the French arpent in Louisiana and the Spanish vara in Texas, in which states those units are today the common units of land measure. Another example is found in France, where, in some sections, the old units of land measure are still predominant.

When outlying districts are incorporated within city limits, parcels of land are much reduced in size and smaller units come in. This gives an opportunity for the introduction of the metric system, but with the result that, in the older portions of the town, the old units are used, while in the newer portions we find the new ones.

Similarly, initial surveys of the hinterland give an opportunity for the use of new units, but again with the result that the older portions of the country are measured in one set of units and the newer in another.

In Uruguay, where the laws are more severe and more rigidly enforced than in any other country, it has been found necessary to authorize the use of old units for the measurement of land, while in other countries the laws, in this application, are quietly ignored. This is the more significant because all transfers of real estate, as matters of public record, come before the eyes of officers of the law. In other countries, again, the purchase and sale are made in Spanish units and the day is then saved by inserting metric equivalents in the documents of record.

In marine measurements and sea shipments the English system is used everywhere, although mixed with metric units, especially for inland navigation.

Classified in another way, the most-used metric units are those of capacity. Next come those of weight, and, trailing far in the rear, those of length and their correlatives of area. This is in accordance with a law which long ago made itself apparent.

The Result of a Great Series of Experiments

We have in this Report a composite picture of the result of many attempts to adopt the metric system, that result being uniformly the addition of that system to those previously prevailing, and it is this that we must contemplate as the result of the attempt to adopt it here. We must compare what we have with what we will get, not with what one may hope we will get. Moreover, it must be noted that had all these countries succeeded in this great experiment, it would have no significance for our guidance, because of the greater importance of our manufacturing industries. France adopted the system before the beginning of the manufacturing era, and Germany adopted it before the development of manufacturing in that country. Every one knows that the rise of Germany as a manufacturing nation began after the war of 1870. South American countries are not manufacturing countries. More manufacturing is done in the city of Philadelphia than in all South America.

We see, then, that in western Europe the system was adopted before the development of manufacturing and that manufacturing has developed with and in it, while in South America practically no manufacturing is carried on.

Great Britain and we are the first to be asked to change our manufacturing units, for which there is not a shadow of a precedent.

Seldom has an effort of such magnitude been made. We have here a record of twenty experiments on a national or, collectively, a continental, scale, and their net result is to demonstrate the wisdom of the conclusion arrived at by John Quincy Adams after four years of investigation and nearly a century ago:

"The substitution of an entire new system of weights and measures instead of one long established and in general use, is one of the most arduous exercises of legislative authority. There is, indeed, no difficulty in enacting and promulgating the law, but the difficulties of carrying it into execution are always great and have often proved insuperable."

Discussion of Weights and Measures

The discussion of Mr. Halsey's paper, from which extracts have been given above, is reported in the January issue of the Journal of the A. S. M. E. The paper evoked a very lively discussion, both sides being emphatic in the expression of their opinions. As usual with this topic there were two groups; Mr. Halsey and his supporters looked at the question from the viewpoint of the manufacturer and the machine shop, while the opposite group was influenced by the theoretical or scientific advantages that the metric system would bring about.

THE REGISTRATION OF PROFESSIONAL ENGINEERS

(The movement toward the licensing of engineers has come up in several of the western states. In anticipation of action by this year's State Legislature in California, the San Francisco Section of the A. S. C. E. in conjunction with each of the four local sections of the other national engineering societies, have prepared an Act which seems to meet the requirements. The text of this is given below and will prove of interest in view of like developments elsewhere throughout the West.—The Editor.)

The people of the State of California represented in Senate and Assembly, do enact as follows:

Section 1. Definitions. As used in this act:

1. The "board" means the state board of engineering examiners provided for by this act.

2. A person practices professional engineering within the meaning of this act who practices any branch of the profession of engineering other than military engineering. The practice of said profession embraces the design and the supervision of the construction of public and private utilities or works such as railroads, bridges, buildings, highways, roads, canals, tunnels, harbors, river improvements, lighthouses, wet docks, dry docks, ships, barges, dredges, cranes, floating docks and other floating property, the design and the supervision of the construction of steam engines, turbines, internal combustion engines and other mechanical structures, electrical machinery and apparatus, and of works for the development, transmission or application of power, power plants, the distribution of steam, water, gas and other elements, heating and ventilating, the examination of mining properties, the supervision of mining and metallurgical operations, and the design and construction of structures and works necessary to such operations, and the design and the supervision of construction of municipal works, irrigation works, water supply works, sewerage works, hydro-electric works, chemical works, valuations and appraisements, and structural works and other public or private utilities or works which require for their design or the supervision of their construction such experience and technical knowledge as are required in Section 7 of this act for admission to examination. The enumeration of any public or private utilities or works in this section shall not be construed as excluding any other public or private utilities or works which require such experience and technical knowledge for their design or the supervision of their construction. The execution as a contractor of work designed by a professional engineer or the supervision of the construction of such work as a foreman or superintendent for such a contractor shall not be deemed to be the practice of professional engineering within the meaning of this act.

3. "Professional engineer" means any person who practices professional engineering.

Sec. 2. Qualifications. After July 1st, nineteen hundred and twenty, no person shall practice professional engineering without having first been duly and regularly registered by the board as a professional engineer as required by this act nor shall any person practice professional engineering whose authority to practice is revoked by the board; and after July 1st, nineteen hundred and twenty, no diploma or certificate conferred on or granted to a person other than a certificate issued under this act by the board or its secretary shall be lawful authority for the practice of professional engineering.

Sec. 3. The State Board of Engineering Examiners. There shall be a state board of engineering examiners consisting of nine members to be appointed by the governor. Of the members of the board first appointed hereunder three shall hold office until July 1st, nineteen hundred and twenty-one, three shall hold office until July 1st, nineteen hundred and twenty-three, and three shall hold office until July 1st, nineteen hundred and twenty-five; and the term of office of each member so appointed shall begin on July 1st, nineteen hundred and nineteen. Upon the expiration of each of such terms the term of office of each member thereafter shall be six years from July 1st. The governor may remove any member of the board for misconduct, incapacity or neglect of duty. Vacancies in the board caused by death, resignation or removal from office shall be filled by appointment by the governor for the unexpired term. Each member of the board shall be a professional engineer of at least ten years active experience and of recognized good standing in his profession, shall be at least thirty-five years of age and shall have been a resident of this state for at least one year immediately preceding his appointment. Each member of said board, except the members first appointed hereunder, shall also be a registered professional engineer. The members of the board shall serve without compensation except traveling and other necessary expenses.

Sec. 4. Certificate of Appointment; Oath; Powers. Every member of the board shall receive a certificate of his appointment from the governor and before beginning his term of office shall file with the secretary of state the constitutional oath of office. Each member of the board first appointed hereunder shall receive a certificate of registration under this act from said board. The board or any committee thereof shall be entitled to the counsel, advice and services of the attorney general, shall have power to compel the attendance of witnesses, and may take testimony and proofs concerning all matters within its jurisdiction. The board shall have an official seal to be furnished and provided by the secretary of state. The board may make all by-laws and rules not inconsistent with law needed in performing its duties; but no by-law or rule by which more than a majority vote is required for any specified action by the board shall be amended, suspended or repealed by a smaller vote than that required for action thereunder.

Sec. 5. Officers; Meetings; Quorum. The board shall biennially elect from its members a president and a vice-president for the ensuing biennial term. The board shall appoint a secretary, who shall not be a member of the board, but who shall possess the qualifications required by this act for members thereof. The secretary shall hold office during the pleasure of the board and shall receive such compensation as the board may decide. He shall give a bond in such amount and with such sureties as may be approved by the state comptroller conditioned for the faithful performance of his duties and for the accounting for, and payment over of, all moneys received by him. The secretary shall keep on file in the office of the board a record of all certificates of registration issued, and he shall receive and account for all fees derived from the operation of this act. He shall also perform such other duties as may from time to time be assigned to him by the board.

The board shall hold at least six stated meetings in each year. Special meetings may be called in such manner as the by-laws of the board may provide. Notice of all meetings shall be given in such manner as the by-laws of the board may provide. At any meeting of the board held solely for the examination of candidates for registration three members shall constitute a quorum; but if three or more members shall not attend at the time and place fixed for such meeting, the member or members present may adjourn the meeting from time to time until a quorum be present. At all other meetings a majority of the board shall constitute a quorum.

Sec. 6. Payment of Salaries and Expenses; Report. The fees derived from the operation of this act shall be paid

into the state treasury and held in a special fund. Warrants for the payment of salaries and expenses incurred shall be issued by the state comptroller and paid by the state treasurer out of the funds provided therefor upon presentation of vouchers regularly drawn and approved by the president and the secretary of the board.

On or before the first day of February of each year beginning in the year nineteen hundred and twenty the board shall submit to the legislature a written report of its proceedings for the preceding year and shall file with the secretary of state a copy of said report together with a complete statement of the receipts and expenditures of the board for the preceding year, verified by the oath of the secretary, and a complete list of all persons registered to practice professional engineering under this act with their addresses and the dates of their certificates of registration.

Sec. 7. Admissions to Examinations. The board shall admit to examination any candidate who pays a fee of five dollars and submits evidence, verified by oath and satisfactory to the board, that he

(1) is more than twenty-one years of age,
(2) is of good character, and
(3) has been engaged upon engineering work for at least six years and during that period has had charge of engineering work, as principal or assistant, for at least one year,
(4) or, in lieu of the third requirement specified above, is a graduate from an engineering school of recognized good reputation and has been engaged upon engineering work for at least four years and during that period has had charge of engineering work, as principal or assistant, for at least one year.

Sec. 8. Examination. Examinations for registration shall be held at stated or special meetings of the board at such times and at such places within this state in each year as the board shall determine. The scope of the examinations and the methods of procedure shall be prescribed by the board. The examinations may be either oral or written or partly oral and partly written. As soon as practicable after the close of each examination the members of the board who shall have conducted such examination shall make and sign and file in the office of the board a certificate stating the action of the board upon the application of each candidate, whereupon the secretary of the board shall notify each candidate of the result of his examination.

Sec. 9. Certificates of Registration. Upon receipt of an additional fee of twenty dollars the board shall issue to any applicant who has been certified as having passed the examination conducted by the board a certificate of registration signed by the president and the secretary of the board under the seal of the board, whereupon such applicant shall be authorized to practice professional engineering as defined by this act.

The board shall from time to time examine the requirements for the registration of professional engineers in other states, territories and countries and shall record those in which, in the judgment of the board, standards not lower than those provided by this act are maintained. The secretary of the board, upon the presentation to him by any person of satisfactory evidence that such person holds a certificate of registration issued to such person by proper authority in any such state, territory or country so recorded and upon receipt by him of a fee of twenty-five dollars, shall issue to such person a certificate of registration under this act signed by the secretary under the seal of the board, whereupon the person to whom such certificate is issued shall be entitled to all the rights and privileges conferred by a certificate issued after examination by the board.

Sec. 10. Registration without Examination. The board shall at any time on or before July 1st, nineteen hundred and twenty, issue a certificate of registration signed by the president and the secretary of the board under the seal of the board upon due application therefor and the payment of a fee of twenty-five dollars, to any candidate who shall submit evidence, verified by oath and satisfactory to the board, that he is of good character and has practiced professional engineering for at least ten years immediately preceding the date of his application and during that period has had charge of engineering work as principal or assistant for at least two years. After July 1st, nineteen hundred and twenty the board shall issue certificates of registration only upon examination as hereinbefore provided.

Sec. 11. Registry; Revocation and Reissue of Certificates of Registration. All certificates of registration issued by the board or its secretary shall be in such form as the by-laws of the board may prescribe. Before any certificate of registration is issued by the board or its secretary, it shall be numbered and recorded in a book kept for that purpose in the office of the board and the number of the certificate shall be noted on the certificate. Such record shall be open to public inspection and in all actions or proceedings in any court such record or a transcript of any part thereof certified by the secretary of the board under the seal of the board to be a true copy shall be entitled to admission in evidence.

The board shall have power at any time to inquire into the identity of any person claiming to be a registered professional engineer and after due service of a notice in writing, require him to prove to the satisfaction of the board, that he is the person authorized to practice professional engineering under the certificate of registration by virtue of which he claims the privilege of this act. When the board finds that a person claiming to be a professional engineer registered under this act is not in fact the person to whom the certificate of registration was issued, it shall reduce its findings to writing and file them in its office. Such findings shall be prima facie evidence that the person mentioned therein is falsely impersonating a professional engineer of a like or different name.

The board may revoke a certificate of a professional engineer for fraud or deceit in his practice or in the securing of his certificate or for the conviction of crime. Proceedings for the revocation of a certificate of registration shall be begun by filing with the board a written charge or charges against the accused. These charges may be preferred by any person or corporation or the board may on its own motion direct its secretary to prefer such charges. When charges are preferred against a professional engineer registered under the provisions of this act, the board shall designate not less than three of its number as a committee to hear and determine said charges. A time and place for the hearing shall be fixed by said committee and a copy of the charges together with a notice of the time and place for the hearing shall be served upon the accused or his counsel at least ten days before the date fixed for said hearing. Where personal service or service upon counsel cannot be effected and such fact is certified on oath by any person duly authorized to make legal service, the board shall cause to be published for at least seven times, the first publication to be at least thirty days prior to the hearing, in two newspapers published in the section of the state in which the accused was last known to practice, a notice to the effect that at a definite time and place a hearing will be had on the charges against the accused upon an application to revoke his certificate. At said hearing the accused shall have the right to cross-examine witnesses against him and to produce witnesses in his defense and to appear personally or by counsel. The said committee shall make a written report of its findings and recommendations and shall forthwith submit the same to the board. If the board shall find that said professional engineer has been guilty of any fraud or deceit in his practice or has been guilty of any fraud or deceit by which he was admitted to practice or has been convicted of crime, it shall revoke his certificate of registration. A two-thirds vote of all the members of the board shall be necessary for this action. The action of the board shall be recorded in the same manner as certificates of registration are recorded and the name of the person whose certificate of registration is so revoked shall be stricken from

the list of registered professional engineers and he shall be disqualified from practicing as professional engineer.

The board may re-issue a certificate of registration to any person whose certificate has been revoked, but only after the expiration of one year from the date of such revocation, for reasons which the board shall by a two-thirds vote of all its members determine to be satisfactory.

Sec. 12. Action of the Board. The members of the board or of any committee thereof and the secretary of the board in granting, withholding, revoking or re-issuing a certificate of registration shall be deemed to be acting as officers of the state and it shall be the duty of the attorney general to represent and appear for them or any of them in any action or proceeding brought against them or any of them because of any such act.

Sec. 13. Certificate Presumptive Evidence. Every unrevoked certificate and endorsement of registry made as provided in this act shall be presumptive evidence in all courts and places that the person named therein is legally registered.

Sec. 14. Penalties. Any person who not being then legally authorized to practice professional engineering within this state according to the provisions of this act and so registered according to law shall practice, or attempt or advertise to practice, or hold himself out as authorized to practice professional engineering or shall use in connection with his name or otherwise assume, use or advertise any title or designation tending to convey the impression that he is a professional engineer, and any person who shall buy, sell or fraudulently obtain any certificate of registration or who shall aid or abet such buying, selling or fraudulently obtaining or who shall practice, or attempt or advertise to practice or hold himself out as authorized to practice professional engineering under cover of any certificate obtained or issued fraudulently or unlawfully or under fraudulent representations or mistake of fact in a material regard and any person who shall practice, or attempt or advertise to practice, or hold himself out as authorized to practice professional engineering under a false or assumed name or who shall falsely impersonate any professional engineer or former professional engineer of a like or different name shall be guilty of a misdemeanor.

Sec. 15. Application of Act. This act shall not apply to any professional engineer working for the United States government; nor to any professional engineer employed as an assistant to a professional engineer registered under this act; nor to any professional engineer coming from without this state and employed therein until a sufficient time, as prescribed by the rules of the board, shall have elapsed to permit the registration of such person under this act, provided that before practicing within this state he shall have applied for the issuance to him of a certificate of registration and shall have paid the fee prescribed in this act for admission to examination.

Sec. 16. Appropriation. There shall be appropriated for the use of the board for the payment of salaries and expenses under this act from moneys not otherwise appropriated the sum of five thousand dollars.

Sec. 17. Time of Taking Effect. This act shall take effect on the first day of July, nineteen hundred and nineteen.

ITALY UTILIZES VOLCANIC POWER

The present enormous price of coal in Italy, according to the Italian Bureau of Public Information, has resulted in the realization of an idea which at first thought seemed but a dream, but which instead has been developed in a marvelous manner and is assuming quite considerable importance: This is the industrial exploitation of one of the features of vulcanism and that is the natural heat emitted from the soil in those regions more or less volcanic in character.

The first experiments along this line were made some years before the war by Prince Ginori-Conti in Tuscany at Larderello, near the salt-mines of Volterra, a region extensively covered with volcanic formations, the most wonderful being the so-called "soffioni," which are certain volcanic vents emitting powerful jets of very hot steam containing boric salts and various bases used in the extraction of boracic acid. Instead of limiting the use of these steam-jets, as in the past, to extracting the salts contained in the exhalations of these natural vapor-vents, the ejection of the steam is stimulated by boring holes. In this way it is possible to obtain powerful jets at a pressure of two or three atmospheres, according to the locality, and in some exceptional instances as high as five atmospheres, the temperatures varying from 150 to 165 degrees Centigrade. These jets maintain their force and temperature unchanged for many years, and they are not affected even when other openings, not too near each other, are bored in the ground, proving that they do not influence each other reciprocally, so great is the underlying thermic energy below. In 1905, Prince Ginori-Conti applied this natural steam to a 40 h.p. engine, using only a small section of the Nenella fissure, which is the most powerful "soffione," the steam ejected having a pressure of five atmospheres.

The results obtained during several years of experimentation were satisfactory, so that he continued to make larger and deeper borings, measuring the force of the steam ejected; combined, this force could operate engines of many thousand horsepower.

In 1912 an experiment was made, very wisely on a more modest scale but sufficient to obtain conclusive results, for which a 300 h.p. turbine-alternator was used.

Later, because of the enormous increase in the price of coal, the Prince decided to exploit the thermic energy of these soffioni on a much larger scale, but as other substances are emitted with the steam, among them sulphuric acid which corrodes metals, particularly iron, and therefore the pipes in which the steam was to be collected, he attempted to use this steam only for heating. Three turbine-alternators of 3,000 kilowatts each were installed, fed by boilers at low pressure not heated by coal or other combustible fuel, but by the natural steam, superheated to 165° C., issuing from these soffioni and piped and carried to the boilers.

Today the works at Larderello have a central plant of 16,000 h.p. operating without interruption and distributing current to Florence, Livorno and Grosseto; its capacity is soon to be increased.

Here we have a new and original utilization of Italy's natural wealth; current is generated not by the use of "white coal" (water-power), but by means of heat energy of volcanic origin.

As the natural steam available at Larderello and the surrounding country is, one might say, unlimited and depends upon the number of bore-holes made in the goraciferous soil, the great possibilities for further development are readily seen.

THE SHOP COMMITTEE AND ITS FUNCTION

BY J. M. WADSWORTH

(An increase in output together with a saving in fuel is as much a necessity in peace times as in war. The good work initiated in the power plant by the U. S. Fuel Administration should not cease with the withdrawal of the patriotic stimulus. A suggestion of how interest in this matter may be kept up is here made by the man who was Administrative Engineer for the Fuel Administration in California.—The Editor.)

Although the incentive of war emergency is removed, the need for fuel and power conservation still exists. It is the hope of men who have devoted their energies towards these economies as a vital war measure that the work so initiated may continue and enlarge as a permanent and lasting benefit.

The public is acquainted with the necessity and advantage to be gained by careful administration and use of our national resources.

It is the purpose of this article to develop a practical plan for instituting these economies in the industries. The U. S. Fuel Administration in conducting its work has endeavored to secure the appointment of a committee of employes from the personnel of each company for the conservation of fuel and power used by that company. The work has been greatly facilitated and a lively interest stimulated by the voluntary efforts of these men on analyzing and studying their own plants and labors for increased productiveness at lessened cost. In fact, the practical advantages gained have been so tangible and the savings accomplished so material, that many companies have retained their committees in force permanently. This is as it should be. Plant owners should appoint an individual or a committee to study conditions in the boiler and engine room and throughout the plant. The duties should be the organization of and carrying out of methods for the prevention of waste and increase of plant effectiveness.

During the war incentive enough existed to encourage the work, but now with that stimulus removed something else must replace it. Some form of bonus arrangement should be instituted whereby a portion of the saving made should be apportioned among the men instrumental in accomplishing it. That this plan should not react to the benefit of the committee men alone, who no doubt will owe their results to the good work of many operators, it is believed that the bonus system should apply in general throughout the plant. That is, the committee should study each department and determine the normal output of each worker or department as closely as possible. Then, each should receive a bonus for increased output. In this way an interest will be aroused and a loyalty encouraged towards the aims of the committee and company. In addition, annual bonuses should be apportioned to the committee and the departments affected by the savings accomplished during the year.

For these purposes a most accurate knowledge of the business is necessary and regular daily or weekly records of all departments made. The writer has no hesitancy in saying that the benefits derived by an owner through added loyalty and satisfaction of his employes and increased knowledge of the items entering into operating costs of his plant departments will be stupendous.

The Fuel Administration in first recommending the committees expected their duties would be solely in connection with the use of fuel and power. With this in mind, a circular was issued to all power plants, which included the following hints to committeemen:

"The wide variation in conditions surrounding the use of power, light and heat is against any arbitrary rulings governing shop operations. The following points, however, should in a general way be of assistance to your committee:

Eliminate operation of motors when machines are idle, by means of convenient switches.

Group machines, so that driving motors or engines operate at their highest efficiency.

See that all bearings are regularly oiled and inspected to correct alignment and insure operation with least friction.

Eliminate belt slippage, so far as possible.

Stagger manufacturing operations so that peak loads will be flattened as much as possible.

In alternating current installations, provide means for improving the power-factor conditions.

Reduce elevator service to a minimum.

Reduce hot water to a minimum.

Stop all leakage in water spigots, pipes, etc.

Reduce number of lights wherever practicable. Reduce candle power of lights wherever possible.

Eliminate use of carbon lamps and replace with mazda or other high efficiency lamps.

Eliminate arc lamps by using lighting units of more efficient type.

Provide a thermometer in different parts of the shop and make arrangements to keep the temperature within reasonable limits.

Eliminate heating radiators or piping not in actual use.

Wherever possible provide storm doors and storm windows on all openings, used during winter months."

The notice concluded to the effect that many other ways to effect conservation would, no doubt, be devised by the committees.

This increased scope of the committees is only hinted at in this article. A careful study will enable a committee to outline improvements and institute economies not apparent, except from such study. Very possibly, in many plants, it would be exceedingly difficult or impractical to effect a bonus system to the individual. However, in such cases his department might easily be so handled and the bonus then apportioned in the department.

Finally, the increase in effectiveness and loyalty among the employes through the creation of such a committee is cause enough for its existence, and if correctly chosen, the results attained will quickly justify its continuance.

REVIVING OIL WELLS BY ELECTRICITY

The cooling of oil beds due to ingress of air sometimes thickens the crude oil and prevents its flow. The recently devised method of applying an electric current to the warming of the oil offers special advantages over hot water or steam which can only be used at moderate depths. The oil is heated without loss, and, much gas geing generated, a pressure is set up which in some cases has forced the oil to the surface in bore-holes of great depth.

SPARKS—Current Facts, Figures and Fancy

(Japan, France, Italy, South America, Australia, Germany and England all are represented in these items of electrical interest. An annual report submitted in moving pictures in Louisville, and deep diving in the Sierras as a part of Western hydroelectric development are also noted.—The Editor.)

The shortage of material in Germany is only now being realized. At a recent exhibition at Frankfurt, substitutes for leather were especially prominent. Among the materials used for the soling of shoes was rubber, felt, wood, paper and a new compound, perhaps the most successful, in which nitroglycerine forms an important part.

* * *

The difficulties of finding employment for the vast industrial plants of war time seems not to be the greatest problem of England, but rather to find enough factories to meet her peace time demand. In spite of the vast steel works in existence, a new steel company has recently been formed of which the capital will soon be increased from five to twenty-five millions.

* * *

Water power has been put to more uses than the generation of electricity. The Italian government supplies its army with little coffee grinders and whole berries—and during the Alpine campaign the ingenious carabini hitched their grinders to the busy mountain streams and had their coffee prepared by water power. The energy saved was not great, but the fact that the device worked gave them a great deal of satisfaction.

* * *

Scholarships for scientific investigators to the sum of 115,000 yen for this fiscal year have been voted by the Japanese diet. A sum of from 500 to 10,000 yen is given to each investigator. Among the subjects of study relating to electricity are: The vacuum and its application, the spectrum study of the X-ray and light, generation of high voltage and vacuum discharge, and the electrical study of biology.

* * *

The part America may play in France's rehabilitation is told by a prominent business man of Paris who explains that before the war all machinery, from lighting fixtures to motors and printing presses, were obtained from Germany, but that now the United States will be the market. Over 200 million francs will be required in textile machinery alone, according to this expert, practically all of which America can supply if she will.

* * *

Based on the budget of a normal family, Australia alone of all the great countries has had a lower average increase in the cost of foodstuffs than the United States. From July, 1914, to September, 1918, increases were as follows: Australia 30 per cent, United States 60 to 70 per cent, Holland 70 per cent, Denmark 80 per cent, Great Britain 104 per cent, Germany, Belgium, Norway and Hungary, 150 to 200 per cent, Austria, Finland and Russia more than 200 per cent.

* * *

It is reported in the London Times that the coal production in the United States is 477,000,000 tons per year, with only 723,000 persons employed; while the United Kingdom production, on the other hand, is only 260,000,000 tons, and 1,069,000 people are employed. In other words, United States production per man is 819 tons and the United Kingdom production per man only 249 tons. This is, of course, due in part to our wasteful methods of mining.

* * *

The troubles of the telephone companies in the tropics are legion. Wooden poles are practically out of the question owing to the wood-eating ant and the bird life which honeycombs the poles. A new difficulty is now reported from Porto Rico in the growth of aerial plant life along the wires. These little plants of various varieties derive all their sustenance from the air and offer much the same problem to the telephone company as a heavy fall of snow in a northern climate.

* * *

Friendly relations between nations are greatly promoted by the moving picture, according to one business man from South America. The United States is particularly fortunate in this respect as American films are everywhere popular and the foreign countries become intimately familiar with American customs and appearance and feel a real brotherly interest in a people whose emotions and actions are so evidently but little different from their own.

* * *

An annual report rendered in moving pictures is the innovation inaugurated by the general manager of the Louisville Industrial Foundation. After the cinematographic review is presented to the stockholders, it will then be exhibited at the various motion picture theatres in the city of Louisville. The use of the film in merchandising is quite popular now but its adoption as a means of presenting a clear and impressive record of the accomplishments of an industrial development organization is said to be without precedent.

PERSONALS

H. J. Gille, salesmanager of the Puget Sound Traction Light & Power Company, comes to his new office as president of the Northwest Electric Light and Power Association with unusual qualifications for piloting the affairs of that organization through the difficult problems that await solution in the power industry of the West. Mr. Gille has actively been engaged in the electrical industry in the West for many years and as one of its sturdy pioneers he has especially been active in bringing to his district new industries and new commercial enterprises. His vision in formulating a constructive commercial policy for his company has largely been the factor that has aided so wonderfully in building up a reputation for sane, conservative building and yet in creating an industrial empire in and around Seattle that in many respects has made that city the most important commercial and industrial center west of the Rocky Mountains.

J. D. Bush, manager of the telephone company at Santa Barbara, was a recent San Francisco visitor.

F. E. Weymouth, chief of construction of the reclamation service, Washington, has been in San Francisco recently on business.

J. W. Redpath and M. A. De Lew have both been recent sufferers from the prevailing epidemic. Mr. De Lew is again about his business and Mr. Redpath is reported better.

H. W. Crozier, mechanical and electrical engineer for Sanderson & Porter, has been named a trustee of the Mechanics Institute of San Francisco.

Captain Harold Yost, formerly in the distribution department of the Pacific Gas & Electric Company, has arrived in Berkeley, Cal., from Camp Lewis, Wash.

Elmer Dover, vice-president of H. M. Byllesby & Company, in charge of the Byllesby properties in the Pacific Northwest, has resigned, effective February 1st.

Major C. E. Hickok, formerly city engineer of Alameda, Cal., is en route from Washington, D. C., for Alameda, where he will resume his former duties as city engineer.

John R. Brownell, superintendent of the California Industrial Accident Commission, has recently gone to Washington, D. C., to attend a conference on safety matters.

Colonel Chas. N. Black of the Ordnance Department, U. S. A., who was formerly general manager of the United Railways of San Francisco, is a recent San Francisco visitor.

S. Waldo Coleman, president and general manager of the Coast Counties Gas & Electric Company, has been re-elected a director of the Italian-American Bank in San Francisco.

Francis Maslin, formerly connected with the Alameda district of the Pacific Gas & Electric Company but now an engineer in the American Expeditionary Forces, has returned to Pensacola, Fla.

Captain Chas. H. Lee, formerly an engineer with the Los Angeles Aqueduct, who contributed noteworthy articles to the Journal of Electricity on precipitation in the Southern Sierra Nevada Mountains of California, was engaged in water supply work for animals and men of the First Army front during both the St. Mihiel and Verdun drives, August 24 to November 11, 1918.

F. D. Nims, vice-president and general manager of the Washington Coast Utilities recently returned from a six-weeks business trip. Boston and Chicago were the chief points in his itinerary.

W. D. Sultan, lieutenant of engineers, formerly in the office of A. F. Hockenbeamer, vice-president of the Pacific Gas & Electric Company, is again a civilian, with his former position in San Francisco.

Archie J. Twogood, recently with the electrical engineering department of the Southern Pacific Company, is now assisting with the technical instruction in the Department of Education of the Portland Y. M. C. A.

Jean A. Hardel, a mechanical engineer from Paris, France, has returned after making an exhaustive investigation of coal and fuel oil firing throughout the United States, including the Pacific Coast territory.

Robert L. Eltringham, electrical engineer for the California Industrial Accident Commission, suffered an attack of the influenza during the last month but his friends are glad to see that he has recovered and is back at his work.

A. Emory Wishon, assistant general manager of San Joaquin Light & Power Corporation, after spending two weeks at St. Luke's Hospital in San Francisco with an attack of influenza is now well on the road to recovery.

C. M. Brewer, manager of the Richmond division of the Western States Gas & Electric Company, has been appointed vice-president and general manager of the Mountain States Power Company, operating in Montana, Idaho, Washington and Oregon.

R. H. Ballard, vice-president, and A. N. Kemp, controller of the Southern California Edison Company, recently spent some days in San Francisco where they succeeded in having a sixteen million dollar bond issue approved by the Railroad Commission.

D. J. Young, of the San Diego Consolidated Gas & Electric Company, San Diego, California, has been appointed vice-president and general manager of the Tacoma Gas & Fuel Company, Tacoma, Wash., Olympia Gas Company, Olympia, Wash., and the Puget Sound Gas Company, Everett, Wash. All of these appointments were effective January 1, 1919.

J. L. White, formerly manager of the Oregon Power Company at Albany, and W. L. McCulloch, who was mechanical superintendent and chief engineer of the Oregon Power Company, hold the positions respectively of vice-president and secretary of the Pacific Coast Asbestos and Supply Company of Portland and Seattle, which organization has recently taken over the local branch of the Pacific Mill and Mine Supply Company.

Major David P. Mason, professor of forestry at the University of California, has returned to his university duties after an absence of eighteen months, during the larger proportion of which time he was engaged with the forestry work in France, having been promoted from Captain of Engineers to the rank of Major in the Tenth Regiment of Engineers. Mr. Mason's work was largely in southwestern France where a vast ystem of pines had been planted by the French government in former years to protect the seacoast from the formation of unwieldy sand dunes and their consequent changing of the coast line of France. The calling upon this vast supply of timber aided effectively in the saving of the republic by the ready furnishing of much needed timber supplies.

J. W. Thompson has succeeded Sam Russel as manager of the electrical departments of the H. W. Johns-Manville Company at San Francisco .

Chas. G. Hyde, professor of sanitary engineering at the University of California, who has been engaged in national service during the past several months, is again back at his university duties.

R. V. Mills, petroleum technologist of the Bureau of Mines, has returned to the San Francisco office of the Bureau after an extended trip through the eastern and mid-continent oil fields.

F. B. Tough, petroleum technologist of the U. S. Bureau of Mines, with headquarters at the San Francisco office of the Bureau, has returned to California after several months absence in Wyoming and other oil fields, where he has been acting as Special Agent for the Secretary of the Interior in the supervision of oil drilling operations being conducted on public lands.

J. H. Wiggins, petroleum engineer of the U. S. Bureau of Mines, with headquarters at the Bartlesville Station of the Bureau, spent several days during December at the San Francisco office of the Bureau, arranging with officials at that station the details of a plan for making a systematic study of the losses of oil by evaporation between the oil well and the refinery.

Arnold Pfau, consulting engineer in the hydraulic department with the Allis-Chalmers Manufacturing Company and familiar to readers of the Journal of Electricity through his articles on high head turbines, recently passed through San Francisco on his way back from the Orient where he has spent some time.

E. J. Richards, formerly chief electrical engineer for the Arizona Hercules Copper Company situated at Ray, Arizona, is a recent San Francisco visitor. Mr. Richards has recently superintended the installation of three one thousand h.p. Diesel engine units for the Hercules Copper Company.

K. E. Van Kuran, Los Angeles manager of the Westinghouse Electric & Manufacturing Company, has been appointed a member of the Advisory Committee of the California Electrical Cooperative Campaign as an additional representation on that committee of the electric manufacturers.

Lieutenant Willis L. Winter, formerly in the employ of the Westinghouse Electric & Manufacturing Company but more recently in the fighting in the Argonne in France, where he had many interesting experiences in the Signal Corps, is again a private citizen and spending a few days at his San Francisco home.

Chas. A. Rolfe of Redlands, California, has been appointed chairman of the California District of the independent group of telephone companies under Federal control, to assist in carrying out a systematic method of dealing with independent companies to the end that the very best service be given the public.

John A. Britton, vice-president and manager of the Pacific Gas Electric Company, recently spoke to the manufacturers of the San Francisco bay region at a luncheon of the Home Industry League, at which he pointed out the necessity for national legislation which would permit the development of our water resources through private enterprise.

W. H. Hamer, a member of the Institute of Civil Engineers, who is chief engineer of the Port of Auckland, N. Z., is a recent San Francisco visitor. Mr. Hamer is one of the world's best known authorities on reinforced concrete pier construction. He has been making an inspection of work of this nature, including concrete ship construction, in various seaports of America. He is now en route home.

Robt. Larsen, Oregon representative of the Pacific Division of the National Electrical Contractors and Dealers Association, **J. F. NePage,** delegate from Washington, and **J. W. Oberender,** efficient secretary, recently attended the Pacific Division meeting at Sacramento. Mr. NePage was taken with the influenza while in Sacramento and for a time was very low, but is now on the convalescent list.

Sam C. Bratton, for the past eight years commercial manager of the Portland Gas & Coke Company, left Portland about January 15 for New York, where he has been appointed manager of the commercial department of the Electric Bond & Share Company of New York, which is banker and fiscal agent for the American Power & Light Company and its many operating companies, of which the Portland Gas & Coke Company and the Pacific Power & Light Company are a part.

G. E. Pingree has been appointed as vice-president and general manager of the International Western Electric Company, Inc., and vice-president and managing director of the Western Electric Company, Ltd., Canada, succeeding **Gerard Swope,** who has resigned to take the position of head of the International General Electric Corporation. Mr. Pingree has been frequently in the West. He went to China in 1908 as the company's special representative in the Far East and is eminently familiar with that field.

OBITUARY

W. B. Burbeck, formerly in the distribution department of the Pacific Gas & Electric Company and, since returning from the Aviation Service, more recently in the commercial department of this company, died of influenza during the past semi-monthly period. Mr. Burbeck was to have been the new field agent of the California Electrical Cooperative Campaign, in charge of the San Francisco district.

It is with regret that the recent death of D. L. Reynolds, of the Graham-Reynolds Electric Company of Los Angeles, is here recorded. Mr. Reynolds had been in poor health for some time and the ravages of influenza, followed by pneumonia, was more than he could stand. Duncan L. Reynolds came to Pasadena, California, in 1893, when his father, Henry J. Reynolds, retired from connection with the Michigan Agricultural College and brought his family to California. He was born in Old Mission, Michigan, October 2, 1879, and was the third in a family of five sons and two daughters. He went through high school at Pasadena and at the age of 17 went to Baltimore to study dentistry. He graduated from the Baltimore Dental College in 1901, the highest in his class.

Returning immediately to Pasadena, he married Miss Estelle R. Wallace, daughter of Mr. and Mrs. J. C. Wallace of Alhambra and sister of Mrs. S. M. Kennedy, wife of the well-known general agent of the Southern California Edison Company. He then started to practice his profession. After nearly four years of successful work his health required him to give up dentistry and then for the first time he became interested in the electrical business through his brother, Robert L. Reynolds, and soon after became a member of the firm of Holabird Reynolds Electric Company, now the Graham-Reynolds Electric Company, where he has been associated in business with Mr. N. W. Graham for the past fifteen years.

Besides his wife he leaves a fourteen year old daughter, Frances, and a son, Henry J. Reynolds II.

He was an Elk and a Mason and a member of the Jonathan Club of Los Angeles, also a member of the Midwick Country Club of Alhambra, where he was an enthusiastic outdoor man and an especial lover of sport of every kind.

MEETING NOTICES FOR ELECTRICAL MEN

(Unusual activity in western electrical organizations is reported in spite of sporadic remainders of the influenza epidemic. Highway and irrigation conventions have been held in the Northwest and a meeting of the Pacific Division of the National Electrical Contractors and Dealers' Association in Sacramento. A convention of the jobbers is announced for the middle of February and plans are already well under way for the Pacific Coast Section, N. E. L. A. convention of which the date has been set for April 30 to May 2.—The Editor.)

Forthcoming Meetings of Great Helpfulness

THE TIME: April 30 to May 2, 1919.

THE PLACE: Hotel Del Coronado, California.

THE EVENT: The combined electrical conventions of Pacific Coast Section, N. E. L. A., California Association of Electrical Contractors and Dealers, Pacific Division National Association of Electrical Supply Jobbers.

WHAT TO DO ABOUT IT: Plan to make it the one event of the year that you will attend.

Victory Convention, Pacific Coast Section, N. E. L. A.

April 30-May 2 inclusive are the dates for the third annual convention, Pacific Coast Section National Electric Light Association, as determined at an Executive Committee meeting, Los Angeles, Jan. 18th. The convention will be held at Hotel del Coronado, Coronado, California, upon the invitation of H. H. Jones, manager of the San Diego Consolidated Gas and Electric Company and chairman of the convention committee.

Due to illness, Mr. Jones has not yet announced the personnel of this committee but has secured assurances from the management of the Hotel del Coronado that ample accommodations will be available for the large crowd that is expected to attend. The maximum rate will be $5.50 per day for one person occupying room and bath. All meetings will be held in the hotel, which is admirably arranged for the purpose.

A large attendance is already assured, not only because of the members' interest in the great Victory Convention, but also by the fact that the quarterly meetings of the California Association of Electrical Contractors and Dealers and of the Pacific Coast Electrical Supply Jobbers' Association are to be held at the same time and place. The Westinghouse Agent-Jobbers' Association will also schedule a special train from Chicago so that its members may attend this meeting prior to their own annual gathering at Del Monte, May 4-11. This means an additional attendance of 60 or 70 jobbers from all parts of the country.

There is talk, furthermore, of chartering a steamboat from San Francisco to San Diego with a stop at San Pedro so that every one can go to and from the meetings together, with all the attendant advantage of greater opportunity for acquaintanceship.

All the papers to be read at the convention will be printed in the Journal of Electricity of April 15th, a copy of which will be mailed to members in ample time to prepare discussion. The papers will not be read at the meeting, thus allowing full time for discussion. An excellent set of papers and reports dealing with the pressing problems of after-the-war readjustment is being worked out by the engineering, commercial, publicity and public policy committees.

Pacific Coast Division, N. A. C. D.

The Pacific Coast Division of the National Association of Electrical Contractors and Dealers convened at Sacramento on Friday and Saturday, Jan. 10 and 11, 1919. W. D. Kohlway as divisional chairman was in the chair. J. F. NePage represented Washington, Robt. Larsen, Oregon, H. C. Reid, California, and J. W. Oberender of Portland acted as secretary. Routine business occupied the major time of the meeting. Officers were elected as follows: W. D. Kohlwey, Chairman Pacific Division, J. F. NePage, Secretary, and J. R. Tomlinson, national representative from Oregon to replace Sam Jaggar, whose term expired with this year. Later the convention was merged into a joint meeting with the California State Contractors and Dealers' Association. W. D. Kohlwey and J. F. NePage were to have gone to the national convention at Pittsburgh immediately following the meeting, but owing to the illness of Mr. NePage, who was taken with influenza, the trip was not undertaken. The western delegates forwarded a telegram to the national convention conveying their message and urging the classification of trade according to the Goodwin Plan.

BUILDERS OF THE WEST—XLVI

T. A. RICKARD

The mines of the West, from the golden days of 'forty-nine to the magnificent era of the present in production of gold, silver, copper, lead and petroleum have not only dazzled the world with their richness but in the trying years just past they proved of invaluable aid in safeguarding the freedom of its peoples. Beneath this material manifestation there has ever been an underlying spirit of freedom, of hope and of courage that has permeated the great mining industry to an extent experienced in no other line of human activity. To T. A. Rickard, editor of the Mining and Scientific Press, an engineer and writer of the first order, this issue of the Journal of Electricity is dedicated not only for the splendid ideals of constructive helpfulness that pervade his writings, but for the lasting good he has performed in recent months in pointing out the similarity and close union of ideals of this country with those of all the great English-speaking peoples.

Pacific Division, Supply Jobbers

The annual meeting of the Pacific Division Electrical Supply Jobbers' Association, to be held at Del Monte Feb. 13-15, is announced in the following picturesque communication:

Remember that now the War's over all Divisions of People are Pacific but since you are not invited to the Peace Table, come to the one where you are invited. Annual election of officers. Who Knows, You may be chosen as a General in the Pacific Coast Army of Electricians. "The Absent are never chosen."—Timothy 10-17.

San Francisco Electrical Development League

The meeting of the Electrical Development League of San Francisco, held on January 20, 1919, was to have featured the "Adjustment of Utility Regulation," with the members of the California Railroad Commission as guests of honor and speakers of the day. At the last minute, however, the commission was detained in Sacramento. An impromptu program, however, provided a very satisfactory substitute. John A. Britton spoke briefly on the history of the utility commission movement in California, the opposition to it in early days and the present general satisfaction with the institution. L. H. Newbert gave a report of progress on the California Electrical Cooperative Campaign and A. H. Hal-

loran briefly reported on the plans for the N. E. L. A. convention in Coronado this spring. Senator Cutten gave a short resume of Commission activities and spoke appreciatively of the support which had been given the Railroad Commission by the public in the recent raising of rates. The only protests, he said, had come from those enjoying special privileges previous to war times.

Northwest Electric Light and Power Association

The Executive Committee of the Northwest Electric Light and Power Association met recently in Seattle to consider matters of importance to the association. They will endeavor to meet once each month, the next session to be in Portland the middle of February.

Joint Meeting—San Francisco

A Joint Meeting of the San Francisco sections of the national engineering societies was held under the auspices of the American Institute of Electrical Engineers, at The Engineers' Club, 57 Post street, Friday, January 24, at 7 p.m. The subject of the meeting was "A Symposium on Engineering Education," which was discussed by J. W. Beckman, American Chemical Society, John A. Britton, American Society of Mechanical Engineers, C. L. Cory, American Institute of Electrical Engineers, C. D. Marx, American Society of Civil Engineers, and T. A. Rickard, American Institute of Mining Engineers.

The subject under consideration was one of considerable importance, especially at this time, as it is incumbent upon the engineering profession to do its duty in the reconstruction days following the war, and a most interesting discussion developed.

Portland Local Contractors and Dealers

The regular meeting of the Portland District Association of Electrical Contractors and Dealers was held at room 248, Oregon Hotel, Monday evening, January 6, 1919. The Executive Committee reported holding a meeting on Dec. 31, 1918, and appointing the following members to the respective offices and committees:

Chairman Local Association, R. C. Kenney; State Association Committee, F. C. Green; Membership Committee, J. H. Sroufe; Finance Committee, E. L. Knight; Legislative Committee, F. C. Green; Costs and Merchandise Committee, C. P. Scott; Investigating and Adjusting Committee, W. O. Fouch; Entertainment Committee, S. C. Jaggar; Member to the State Executive Committee, J. R. Tomlinson; Treasurer, F. A. Bauman, and Secretary, J. W. Oberender.

The fixture section reported having compiled a new blue print of statements which would be distributed among the members in a short time.

J. C. English reported having been called upon by members of the House-wiring Committee of Portland and explained what was expected of members of the association. Upon motion duly made and carried the association recommended and endorsed the movement and campaign now being promoted and to be carried on under the name of "Your Own Home" campaign. A committee of three was appointed to collect contributions to the support of this campaign.

In the matter of the installation of fire alarm gongs, it was the opinion that such installations should be recommended as would most efficiently provide for a safe and workmanlike installation, but that no discrimination should be made as to the using of battery systems where the owner insisted upon these being used.

Idaho Irrigation Congress

The Idaho Irrigation Congress was held at Twin Falls to consider changes in Idaho's water code, and to make recommendations to the state legislatures for changes in existing irrigation laws. Speakers included A. E. Chandler, president of the California Water Commission; J. B .True, State Engineer of Wyoming; Percy A. Cupper, State Engineer of Oregon, and Prof. O. L. Waller, vice-president of the Washington State College.

American Gear Manufacturers

A meeting of the Standardization Committee of the American Gear Manufacturers' Association was held at Hotel Statler, Buffalo, N. Y., January 13 and 14, 1919.

American Institute of Electrical Engineers

Denver Section —

The regular meeting held Jan. 18, 1919 at the Denver Athletic Club featured the subject of "The Future of the Public Utilities as Affected by the War." The speaker of the evening was Franklin P. Wood, Engineer of Trinidad, Colorado, and F. W. Held and E. A. West of the Denver Tramway Company later led the discussion.

Spokane Section —

A joint meeting was held between the local section A. I. E. E. and the A. S. C. E. and the Spokane Engineering and Technical Association at 8 p.m., Jan. 17, 1919, at the Chamber of Commerce assembly room. J. C. Ralston addressed the gathering on the important and timely subject of the "Big Bend Irrigation Project."

Seattle Section —

The regular meeting of the Seattle section was held at 8 p.m. Tuesday, Jan. 21, 1919. Capt. Norwood W. Brockett, Captain of Artillery, as speaker of the occasion discussed the subject, "My Experiences in France During the Last Year of the War." At the business meeting which preceded the talk, matters of business for the coming year were taken up.

Joint Meeting in Portland

At the recent joint meeting of Portland sections of the A. I. E. E. and N. E. L. A. W. C. Morgan, Ph.D., head of the Department of Chemistry, Reed College, lectured on the "Chemistry of the War." Following the announcement in the last issue of the Journal of Electricity, a brief report of his talk is here given:

He outlined the various uses of nitrogen, comparing it to a soldier who dreads to go over the "top" but when he does he goes to win, it being the same way with nitrogen, as it is a very passive element but when in combination the most active and destructive known.

A poison gas shell is 25 times more effective than ordinary shrapnel. Some of the compounds of nitrogen and chloroform were the most destructive, as the victim could not detect them until after he had been gassed several hours or days. Both nitrogen and chloroform are life-giving and pain destroyers when not in combination.

The nitric acid plants can now make fertilizer, as the world needs additional fertilizer. Before this date the United States had added no fertilizer to its total, trying only to conserve what it had.

The Synchronous Club

The Los Angeles Synchronous Club held a regular meeting at "Ye Adobe Inn" on Jan. 14, 1919, at which G. G. Gillingham discussed the subject of submarine cables and what the Germans tried to do to them. The question of the meeting date and its possible transference to the second Tuesday of each month was discussed.

Reconstruction Convention Resolutions

The activities of the Oregon State Reconstruction Convention, held in Portland January 9-10-11, are well exemplified in the following digest of a few of its resolutions. In all, about thirty resolutions were approved, the majority being primarily aimed to stimulate and create public and private work to aid in relieving the coming employment crisis.

Resolution 2. To create an Oregon Reconstruction Committee, with the duty of formulating and prosecuting plans to meet the economic issues confronting the people during the transition period from war activities to peace industries. Said committee to consist of three members from each of the following organizations: State Chamber of Commerce, Grange, Federation of Women's Clubs, Industrial Association of Oregon, Oregon

Irrigation Congress, Lumber Manufacturers' Association, Oregon Bar Association, State Farmers' Cooperative Association and the Fraternal Cooperative Insurance Societies.

Resolution 10. Urging the governments of the state and each county and city to furmulate plans to provide ways and means to carry on public works to provide maximum employment. Also recommending each county to conduct a census of unemployment, present and prospective. Also to notify the director of the U. S. Employment Service in Portland the result of the census, and to indicate number of men needed for contemplated work.

Resolution 12. Urging corporations and persons who plan building during the coming spring and summer to devise plans to begin such work without unnecessary delay, to furnish employment.

Resolution 15. That it be the sense of the convention that the credit of the state be used to the extent of $5,000,000 a year, during a period of ten years, that amount to be duplicated by the Federal Government, if possible, for the financing of projects of reclaiming arid, swamp, overflowed and logged-off lands, to aid returned soldiers in establishing homes. Also for financing projects for public work essential to land development, including roads, water-power and transportation. Urging state legislature to draft proper bill covering the subject.

Resolution 17. Endorsing the Sinnott bill, appropriating one billion dollars for reclamation and drainage. Favoring Federal aid for developing the Deschutes project and urging the legislature to take steps to fully complete the Tumalo project.

Resolution 19. Recommending to the educational institutions of the state the establishment of educational courses in "highway transport engineering," as recommended by the Council of National Defense.

Resolution 21. Urging that all needy and feasible improvements such as sewers, parks, water works, playgrounds and street improvements be expedited to provide employment, and that all cities and municipalities forward work for which bond issues have already been issued.

Resolution 22. Resolving that similar state conventions be held annually, and urging the Governor to arrange for such a convention to be held early in 1920.

Resolution 23. Requesting the state legislature to submit to the people an amendment to our State Rural Credit Act, providing for the creation of ready-made farms on the Australian and Californian plan. Also urging adoption of constitutional amendment authorizing the levy of graduated land tax, bearing heavily upon uncultivated, arable lands.

Resolution 25. Requesting legislature to enact legislation to enable state, counties and municipalities to develop unused water-power.

HAPPENINGS IN THE INDUSTRY

POWER BONDS AUTHORIZED

The application of the Southern California Edison Company for authority to issue $16,000,000 of new securities, which was filed with the Railroad Commission recently, was granted. The Commission's order authorizes the company to issue $8,000,000 of twenty-five-year 6 per cent general and refunding mortgage bonds to take up a like amount of short time bonds maturing July 1, next. Also to issue $8,000,000 serial 7 per cent debentures, maturing in from one to ten years, to meet bills payable amounting to $6,078,592.98, representing construction work. The bonds are to be sold at not less than 93⅞ and accrued interest.

PURCHASE OF LOWER CALIFORNIA

Considerable interest is being taken in the purchase of Lower California by the United States. The project has been proposed and discussed in Congress and favorably acted upon by the legislatures of several of the western states. Its purpose is to remove the difficulties arising from the international character of the Colorado river at its mouth and the continual necessity for treaties and uncertain agreements in developing and protecting the southwest region from the vagaries of the river. The power project planned by the Yuma irrigation project and the Imperial Irrigation District in conjunction now faces the necessity of carrying its canal and development features into Mexico with the consequent treaty guarantees and uncertainties—and the electrical as well as irrigation interests of this region in consequence watch the progress of the present discussion with considerable interest.

PROPOSED TRAMWAY SYSTEM FOR POOTUNG

The Chinese press reports the flotation of a tramway company to operate at Pootung. The capital of the company is said to be $10,000,000 Mexican (approximately $8,700,000), and the venture is being floated under the auspices of an Anhui millionaire.

The proposed main line will be between Tung Ka Doo and Chuan Sha, a distance of 40 to 50 li (a li is about a third of a mile). It is expected that the proposed line will be of great assistance to the fish merchants in particular and the working people in general. Fish caught in the villages along the coast take a whole night to reach the market in Chuan Sha, and it is expected that the operation of the trams will reduce this time to two hours. Special cars will be constructed to meet the requirements of the fish trade.

Mr. Chow, formerly of the Chinese Tramway Company of Nantano, has been appointed chief engineer, and the plant and machinery will be purchased in the United States.

LICENSING OF ENGINEERS IN JAPAN

According to a law passed seven years ago, electrical engineers are required to hold a government license before attaining the grade of chief engineer. Chief engineers are classified into six grades, mainly according to the voltage of the systems they are to serve. With the exception of graduates from the electrical department of engineering colleges of recognized standing, an examination is required from all applicants. This is held annually and consists of both written and oral tests for the high grades, and a written test alone for the lower. The sixth grade is granted without examination to competent electricians.

SMELTERS STEEL COMPANY

The Smelters Steel Company, Henry Building, Seattle, is constructing a plant on the Commercial Waterway for smelting iron ore from its mines in British Columbia. It is to install four electric furnaces, capable of producing 30 tons of high grade gray iron per day. Furnaces are to be of the arc type with one electrode to each furnace. The ore is an iron oxide and the company has the necessary flux for its purpose near the mine. Equipment has been purchased. G. Lewis Casey is designer of the process and president of the company.

INTERNATIONAL ELECTRIC CORPORATION

With a view to taking advantage of trade opportunities presented by the close of the war, The General Electric Company has formed an export corporation, all of whose stock will be held by the parent company. The probable name of the new corporation will be the International General Electric Corporation. The president of the new corporation will be Gerard Swope who, since January 1, 1913, has been vice-president of the Western Electric Company. Charles Neave of the firm of Fish, Richardson & Neave will be chairman of the board of the export corporation, and M. A. Oudin, foreign manager of the General Electric Company, will be vice-president. All General Electric's foreign interests will be handled by the new organization. Its design will be to stimulate the sale of American-manufactured electrical apparatus throughout the world.

FOREIGN TRADE COURSE

The University of California announces that an Extension course, consisting of fifteen lectures, in the fundamentals of Foreign Trade, started Friday, January 24, at 8 p.m. in Room 237, Merchants Exchange Building, San Francisco. The course is conducted for the benefit of men and women who are interested in foreign trade—especially for those who are engaged during the day in commercial vocations. It covers all the important topics under export trade:—The Analyzing of the World's Markets, Grouping of the World's Markets according to established Trade Routes, Export Policies, International Banking, Marine Insurance, Organization of the Export Office, Collection of Mailing Lists, Advertising and Mail Campaigns, Market Investigations, Selection of and Reports on Agents, Sales and Agency Contracts to the final Execution of an Export Order.

Mr. Herman Virde, who is conducting the course, has

given his life to the study of foreign trade—first as college student; then as commercial attache, traveling salesman, and secretary to the Swedish Commission at the P.-P. I. E. Exposition; and last as branch manager for a large exporting house.

SAFETY FIRST COMMENDED

The safety first organization at the Grant Smith-Porter shipyard of Portland, Ore., has won the title of being the best equipped yard with safety appliances in the United States and the best organized of any. At the outset 40 men are selected from among the employes, and each given a badge with the impress of the seal of the company. These 40 men train for two months and after examination those who pass are presented with a diploma which admits them to a higher degree. Those who fail are kept on the job until they do pass. The committee of 40 workmen meets every week in conjunction with the regular safety first engineers. Foremen, numbering 200, have an organization, acting as a head for the workmen's committee, which is an auxiliary committee, members of which become upon examination honorary members of the foremen's organization, and the Grant Smith-Porter safety first organization. There are three grand divisions—workingmen, foremen, and safety first engineers.

The idea of this particular character of organization by which every man in time becomes schooled in safety first rules and practice, originated with the management of the Grant Smith-Porter yard. The idea has been adopted in all the leading yards in the United States, according to the Emergency Fleet News.

Results of the efficient work of the general organization are shown in the following statistics in regard to the number of accidents: Last July accidents totaled 117, August 96, September 87, October 72, November 35, December 17. During the last two weeks in December there were no accidents of any description. Upon this showing the State Accident Industrial Commission reduced the company's rate 10%.

BUSINESS OPPORTUNITIES IN AERONAUTICS

A committee to cooperate with the Aerial League of America in the advancement of the science of aeronautics has been named by President Benj. Ide Wheeler of the University of California. The league, in asking that a University committee be named, stated that, "Through the tremendous strides forward of aeronautics there are wonderful possibilities for the employment of ingenuity, genius and skill, and business opportunities as great as ever have been created by progress in important lines of human endeavor." It is in order that university men and women may be in touch with such opportunities that the committee was named. The members of the committee are: Professor B. M. Woods, chairman, and Professors J. N. Le Conte, Edmund O'Neill, F. S. Foote, Jr., G. D. Louderback, E. E. Hall, M. E. Haskell, T. M. Putnam, R. T. Crawford, R. F. Raber, N. B. Drury, Dr. L. T. Jones and Mr. Leonard Bacon.

INDUSTRIAL ACCIDENT COMMISSION'S REPORT

The outstanding feature of the report of the Industrial Accident Commission for the fiscal year ending June 30, 1918, is that there were 31 fewer industrial deaths in California during 1917 than there were in 1916. In 1916 the deaths reported totaled 657, and in 1917 the total was 626. In view of the larger number of employes in 1917, and the impetus given to hazardous employment as a result of war activities, the reduction in California's industrial deaths is gratifying.

Expansion has marked the efforts of the Safety Department during the last fiscal year. Inspections to the number of 1,289 were made by the Department's engineers and inspectors, in which plants 79,117 employes were employed. In addition, 1,670 elevators were inspected, 841 boilers and 362 air tanks.

To assist in reducing the number of injuries in the lumber industry, there was produced a motion picture entitled "Preventable Accidents in the Lumber Industry." This picture was made possible by the support and contributions of the California Redwood Association and the California White and Sugar Pine Manufacturers' Association.

Illustrated "Safety First" lectures have been delivered by members of the staff before various organizations throughout the state.

Public hearings were held in San Francisco and Los Angeles to consider General Construction Safety Orders. These orders became effective on January 15, 1918. Committees of employers, employees and others interested were appointed to prepare safety orders for electrical stations, steam shovels and locomotive cranes, and for foundry operations.

An electrically operated gold dredge has been added to the Safety Museum at 529 Market street, San Francisco. The museum now occupies about 3,000 square feet of floor space and contains hundreds of exhibits.

INCREASE IN COPPER PRODUCTION

The production of copper in the United States in 1918 was slightly larger than in 1917, according to preliminary figures and estimates collected by B. S. Butler, of the U. S. Geological Survey, Department of the Interior, from all plants that make blister copper from domestic ores or that produce refined copper. At an average price of about 24.75 cents a pound, the output for 1918 has a value of $473,000,000, as against values of $510,000,000 for 1917 and $190,000,000 for 1913.

The figures show that the smelter production from domestic ores represents the actual output of most of the companies for the first 11 months of the year and the estimated output for December. A few companies gave no figures for November, but furnished estimates of the combined output of November and December. The production of blister and Lake copper from domestic ores was 1,910,000,000 pounds in 1918, against 1,886,000,000 pounds in 1917 and 1,224,000,000 pounds in 1913.

The supply of refined copper (electrolytic, Lake, casting, and pig) from primary sources, domestic and foreign, for 1918 is estimated at 2,450,000,000 pounds, as compared with 2,362,000,000 pounds for 1917 and 1,615,000,000 pounds for 1913.

According to the Bureau of Foreign and Domestic Commerce, the imports of copper in all forms for the first eleven months of 1918 amounted to 535,868,000 pounds, against 556,000,000 pounds for the 12 months of 1917.

The exports of pigs, ingots, bars, plates, sheets, rods, wire, and like copper products for the first 11 months of 1918, as determined by the same bureau, amounted to 692,759,000 pounds; the exports for the 12 months of 1917 were 1,126,082,000 pounds.

At the beginning of 1918 about 114,000,000 pounds of refined copper was in stock in the United States. Adding this quantity to the refinery output of the year shows that the total available supply of refined copper was about 2,564,000,000 pounds. Subtracting from this total the exports for the first 11 months and the estimated exports for the last month shows, on the assumption that there was no change in stocks, that the supply available for domestic consumption in 1918 was considerably more than the 1,316,000,000 pounds available in 1917.

THE EMPLOYMENT SITUATION

Tables have been prepared by the Statistical Section of the U. S. Employment Service showing requests for help from employers as compared with registrations with the Service for jobs for the thirteen weeks ending November 30th, which indicate a general decline in the demand for labor throughout the United States. In a number of sections this decline began early in September; in others there was an

increasing demand up to the middle of October, immediately followed by a sharp decline.

In the middle West the fluctuation is not nearly so great, although in most of the states there is the same steady decline of shortages which existed in September. In Michigan there was a steady increase in shortage until the week ending October 5th, when the demand exceeded the registration by 2.1 to 1. From then on there was a steady decline until the week ending November 30th, when there was a surplus of labor of 1.3 to 1. For the week ending October 26th, Illinois showed some excess in demand over registration, followed by a sharp decline to November 30th. Indiana shows a slight but fairly steady shortage. Idaho, Iowa and Montana all show a steady decline. Nevada reported a shortage of about 6 demands to 1 registration for the week ending October 12th, which declined to 3.58 to 1 for the week ending November 30th. New Mexico was fairly steady with a slight shortage. Nebraska reported demands exceeding registration by about 10 to 1 for the week of September 21st, which declined to 1.29 demands to 1 registration.

On the Pacific Coast: California reports a steady decline up to November 30th, when the supply about equaled the demand. Washington was fairly steady with a slight shortage, while Oregon declined from an excess of demand over registration of about 6 to 1 to an excess in demand of 1.24 to 1.

PICTURES OF ACTIVITIES WANTED IN CHINA

E. G. Babbitt of the Bureau of Foreign and Domestic Commerce, Room 307 Custom House, San Francisco, announces that he has been advised by P. H. Whitham, Trade Commissioner, Peking, that he is anxious to procure pictures relating to western activities such as large buildings, railway terminals, shipbuilding plants, etc. It is claimed the Chinese are particularly interested in and influenced by large undertakings and Mr. Whitham proposes to use these pictures throughout the interior.

RENEWED ACTIVITIES IN GAS AND ELECTRIC INDUSTRIES

BY WILLIAM H. CLARKE
Manager of the Bond Department, H. M. Byllesby & Company

We can again look forward to renewed development of the electric and gas industries, because equipment and apparatus of all kinds should soon be more easily obtainable, as national interests permit the release of manufacturing capacity from government work to ordinary pursuits. The importance of efficient and continuous gas and electric service has been emphasized by war time necessities. For nearly two years utilities have uniformly restricted their requests for equipment and capital, and limited the extension of their business during this period of stress to industries engaged in government work. As a result much of the ordinary and regular development or extension work of utilities during 1917 and 1918 has been postponed and this accumulation will require immediate construction as fast as material and labor become available.

The participation of local capital in the stock and bond issues of utilities has been growing rapidly, and as gas and electric companies further demonstrate their resourcefulness under all conditions, it may be expected that millions of people who have made their first purchases in public securities during the past two years will look to their local utilities as a safe and profitable medium for their investment funds. This mutualization of ownership, or whatever term is applied to the practice of customers taking a financial interest in public service companies of all kinds, develops a true community interest and will have a tremendous effect in successfully thwarting what seem to be dangerous tendencies toward destructive socialism in this country.

TRADE NOTES

Western Representative —

The American Ironing Machine Company of Chicago, Ill., of which H. R. Basford is the Pacific Coast representative, is making arrangements to establish a western warehouse in San Francisco, all goods for the Pacific Coast hereafter being shipped from there. The San Francisco branch is now located at 431 Sutter street, with another branch office at 340—13th street, Oakland, Cal.

New Business —

The Machine Tool Department of A. H. Cox & Company, 307 First avenue South, Seattle, reports much activity. Among recent orders was one placed with the J. F. Standifer Construction Corporation at Vancouver, Washington, for planers and lathes, and another with the Brecker-Brainard Milling Machinery Company of Cordoza, Alaska.

Change of Address —

The Manhattan Electrical Supply Company, Inc., E. M. Haig, factory representative, formerly at 604 Mission street, San Francisco, is now located at 1629 Harvard avenue, Seattle.

Spokane Company —

The Universal Electric Company has been incorporated and has opened offices at N. 230 Post street, Spokane. Carl F. Udhen, A. E. Russel and G. W. Crowder are the incorporators. The incorporation is for $10,000 and is for the purpose of dealing in electrical supplies and equipment.

New Offices —

F. W. Rust & Company, electrical contractors and engineers, have opened offices at 26 Seattle National Bank Bldg., Seattle. Forest W. Rust, the manager, has been engaged in electrical contracting in Seattle for the past six years. The company has secured the contract for electric lighting and power installation in the new factory for the Curran-Gheen Shoe Manufacturing Company at 2415 Western avenue, also all the electrical work on the post office substation K at the King street station.

Change of Ownership —

E. B. McKinley of Paso Robles, Cal., has resigned his position with the Midland Counties Public Service Company to go into business for himself. He has bought out W. V. Fisk's electric shop in San Luis and will move there to take charge of his business.

A New Organization —

The Porterville Electric Company announces that they are opening in business in Porterville, Cal., and will occupy a store room in the Williams Building. W. C. Little is interested in the concern.

Enlarged Plant —

Ward Brothers of Molson, Washington, have enlarged their electric light and power plant by installing an auxiliary generator and a new oil engine in addition to the steam power equipment already in operation.

Changes Hands —

In accordance with permission recently given by the Railroad Commission, the H. G. Lacey Company of Hanford, Cal., passes out of existence, and the Mt. Whitney Power & Electric Company assumes absolute control of the light and power service for so many years in the hands of the Lacey Company. It is hoped by this reorganization to effect economies which will enable the company to better serve the public. Improvements are contemplated as soon as the necessary financial arrangements can be made, that will strengthen the service of existing lines, rather than any extension of those lines at present.

Sales Conference —

The Montana Electric Company of Butte and Great Falls, Mont., and the Washington Electric Supply Company of Spokane, will hold their semi-annual sales conference at

the latter place February 6, 7 and 8th. Manufacturers whose product is distributed by the associated companies will be in attendance and an extremely profitable session is anticipated.

Personal Items —

H. N. Lauritzen has been appointed Pacific Coast manager of the Duplex Lighting Works of General Electric Company, which is introducing the Duplexlite, a new lighting fixture which, through the use of silk shades, combines all the advantages of both direct and indirect lighting. Mr. Lauritzen has been well and favorably known to Pacific Coast electrical and lighting men for many years, first as the Pacific Coast manager of the Holophane Company and later as special representative of this company with the Pacific States Electric Company. Consequently he is assured a most successful business with this new affiliation.

C. M. Lindsay, formerly sales manager, Hotpoint Division, has been appointed as manager of the new Sales Promotion and Advertising Department of the Edison Electric Appliance Company, Inc., with headquarters in Chicago. This department has been inaugurated by the company for the sole purpose of building up its sales service with its customers to the point of highest possible development. Mr. Lindsay is well known in the West as his former home before going to Chicago was in Ontario, California. His appointment in this capacity is an especially fortunate one, since his long service and experience with the Hotpoint Company, particularly fits him for this position, and also his host of friends throughout the industry will welcome the continuance of his former pleasant association in this broader field of cooperation.

Walter M. Fagan has been appointed sales manager of the Hotpoint Division, Edison Electric Appliance Company, Inc., with headquarters at the general office of the company, 5660 West Taylor street, Chicago.

Cecil Johnston, special representative of the commercial department of the Hotpoint Division of the Edison Electric Appliance Company, spent some days in San Francisco recently on business connected with his company.

THE OLDEST MINING JOURNAL ON THE AMERICAN CONTINENT

In choosing from the many lines of accomplishment those subjects to include in the serial entitled "Builders of the West" which has been appearing in the columns of the Journal of Electricity during the past two years, it soon became apparent that in addition to the builders of material accomplishment, there is another constructive effort at work—not visible to the eye—which has perhaps been even a greater force in bringing about the remarkable engineering achievement of this section. This intangible force may be expressed in words as the spirit of the West—and in the molding of this spirit of constructive effort certain publications in the West have undoubtedly performed a lasting and enduring work. Among this class of builders may be mentioned the Mining and Scientific Press.

On May 24, 1860, the Mining and Scientific Press was founded at San Francisco and is therefore the oldest mining paper on the American continent. The first publishers of the Scientific Press were Winslow & Company, a firm whose active representative was J. Silversmith. He was succeeded in 1862 by W. B. Ewer and C. W. M. Smith, who in turn gave place, December 14, 1863, to Dewey & Company. Thus Alfred T. Dewey became identified with the Mining and Scientific Press, the addition to the name being significant. For thirty years he directed affairs. In June, 1893, J. F. Halloran bought control and retained it until December, 1905, when he sold his interest to T. A. Rickard, who also became editor.

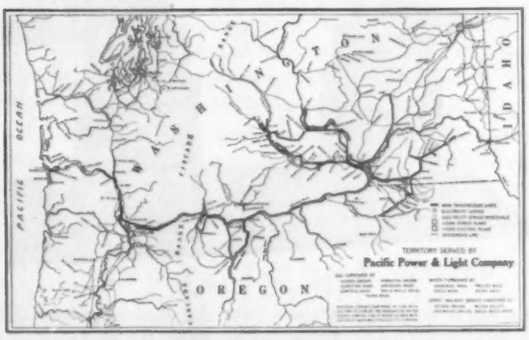
Almon D. Hodges, Jr., who was editor from 1869 to 1871, is now an honored citizen of Boston; Charles G. Yale, who edited the paper from 1871 to 1893, is statistician to the U. S. Geological Survey in San Francisco; and W. H. Storms, since deceased, was in charge between 1897 and 1905. During shorter intervals Dr. Henry De Groot, E. B. Piper, J. D. McGillivray, Clarence S. King and R. L. Dunn served in an editorial capacity. During his management Mr. Halloran also served as editor of the magazine.

Time was when this paper looked only to local support and concerned itself only with local industry. During J. F. Halloran's regime the field of usefulness was enlarged so as to cover the Rocky Mountain region and since he yielded control in December, 1905, the scope of the paper has been further enlarged so as to cover metal mining throughout the world.

The present editor, T. A. Rickard, to whom this issue of the Journal of Electricity is dedicated as a "Builder of the West," comes from a family long known to the West. His grandfather, James Rickard, was a Cornishman who was retained by John Taylor and Sons, one of the oldest and best-known firms of mining engineers in London, to make an examination of the Mariposa Grant in California, which was at that time owned by Gen. John C. Fremont. Mr. James Rickard therefore proceeded to California via the Isthmus route in 1850, and brought with him a 10 stamp mill manufactured in Cornwall. This, it is believed, was the first 10 stamp mill ever erected in this state, or elsewhere in this country. After an exhaustive examination of the Mariposa Grant he finally, after six months, turned it down and went back to Europe, locating in France where he was engineer for some years of one of France's copper properties. Reuben Rickard, brother of James, was the first president of the city council of Berkeley, California.

Nothing is alien to the Mining and Scientific Press that concerns the miner. The name lays emphasis on the mining and then on the scientific aspects of the great search for minerals. The paper was started when mining meant digging holes in the ground, and it has lived to see the application of modern science in every department of a world-wide industry. In 1906 a motto was adopted: "Science has no enemy save the ignorant." It may also be said: Mining has no friend like Science.

In bringing science to the every-day aid of the miner, it has been the privilege of technical journalism to be the agent of transmission, to be the bearer of the knowledge that gives light underground, and to carry the tools that give a tenfold strength to the hand of man. This has been the mission of the Mining and Scientific Press for fifty-nine years; this will be its mission in the years to come.



TWO NORTHWESTERN BOND ISSUES

The map here shown accompanied an announcement of a $350,000 bond issue of the Pacific Power & Light Company, being put on the market by the Lumbermen's Trust Company. The same company is handling $400,000 worth of bonds for the Washington Water Power Company for which it has issued a similar bulletin.

LATEST IN EVERYTHING ELECTRICAL

(A disconnecting switch built for heavy service with a positive lock which does not permit the switch to spring open under electrical expulsion forces, an electrically operated gas meter which would form a very desirable load for a central station and a storage electric water heater and the arguments in its favor are included among the new devices recently presented to the trade.—The Editor.)

MERCURY VAPOR LAMPS FOR AUTOMOBILE-PART PHOTOGRAPHY

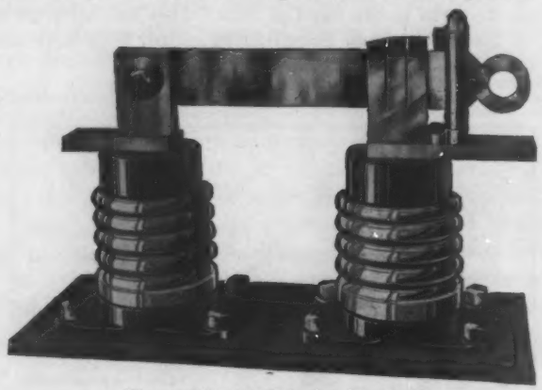
A complete and accurate catalogue of parts is one of the necessities for every automobile manufacturer. Every detail must be illustrated, either separately or assembled with others into one of the parts of the car. A unique method of taking the photographs necessary for these catalogues has been worked out by the Willys-Overland Company. In their photographic department at Toledo is an elevated platform under which can be placed a large flat wooden table. On this are arranged various items each with its appropriate title and number, printed on a card, laid beside it. The boundary of the photograph is marked by black wooden strips. Through a hole in the platform the photographer focuses his camera upon the display below. Light is furnished by four Cooper-Hewitt mercury vapor tubes, hung underneath the platform. Due to the highly actinic quality of the mercury vapor light, the exposure is much shorter than with other illuminants having the same apparent brilliancy.

Photographing automobile parts

The great advantage of this device is that it enables the various parts to be associated with descriptive text, or explanations of the workings of complex apparatus. Much greater speed can be made in getting out instructions, since only the photograph need be taken.

"FRANKLIN" DISCONNECTING SWITCHES

Franklin disconnecting switches are designed to meet the most exacting operating conditions. They are rated on the basis of 1000 amperes per square inch. The base blocks are carefully milled, with clips sweated and pinned and blades are thoroughly ground into the contact clips. Hinges are provided with bronze spring washers which take up wear and make adjustment unnecessary.



Disconnecting switch for heavy use

The switches are mounted on standard Franklin insulators, of light, heavy or extra heavy duty design as the service demands.

The Franklin positive lock is incorporated in the disconnecting switch. The switch blade is held closed by two rugged brass jaws which provide accurately machined bearings top and bottom and a perfect housing and protection for the bronze springs. A lug projects inwardly toward the blade from each jaw casting.

Each jaw is mounted on a rigidly supported upright steel post upon which it may be rotated. A cap-nut at the top of each post keeps the jaw in place.

The pulling ring is pivoted upon the switch blade and includes the cams as shown.

It should be noted that the switch blade is held closed because the jaw forms a closed bridge above it which cannot be broken by electrical expulsion forces. In fact, the jaws are so located that the direction of the resultant electric forces is in a line which tends to hold the bridge more tightly closed.

To open the switch, one pull of a hook in the ring rotates the cams against the lugs which project inwardly from the jaw castings. The jaws are thereby rotated against the springs, and the bridge above the blade is opened so that the blade may be withdrawn.

A single action of the hook closes the switch by pushing the blade down past the jaws, which are beveled at the top so that the blade passes easily. When the blade is entirely closed, the springs return the jaws with a strong, vigorous snap. The hook may then be withdrawn with absolute assurance that the switch is positively locked to stay locked.

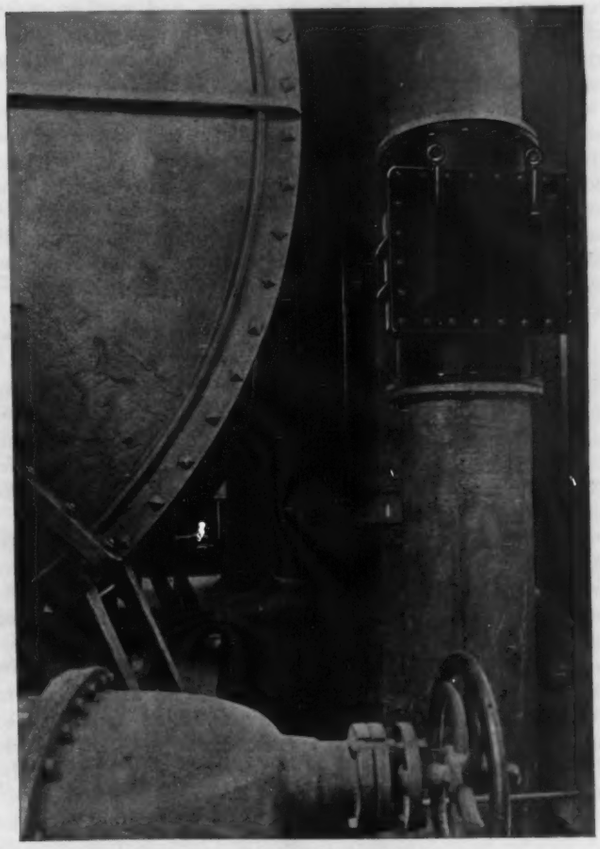
ELECTRICALLY OPERATED GAS METER

The Laclede Gas Light Company in St. Louis have recently installed a 750,000 cubic feet per hour Thomas meter to measure the total gas manufactured in their station "A." This installation is rather interesting because of the assistance it gives in the operation of the plant and the small space it occupies compared to the equipment it replaced. This meter replaces four large wet drum meters,—part of one of which is shown in the accompanying illustration, which also shows the Thomas meter housing. This housing is located in the pipe line between the purifiers and the storage holder and is known as a "make" meter.

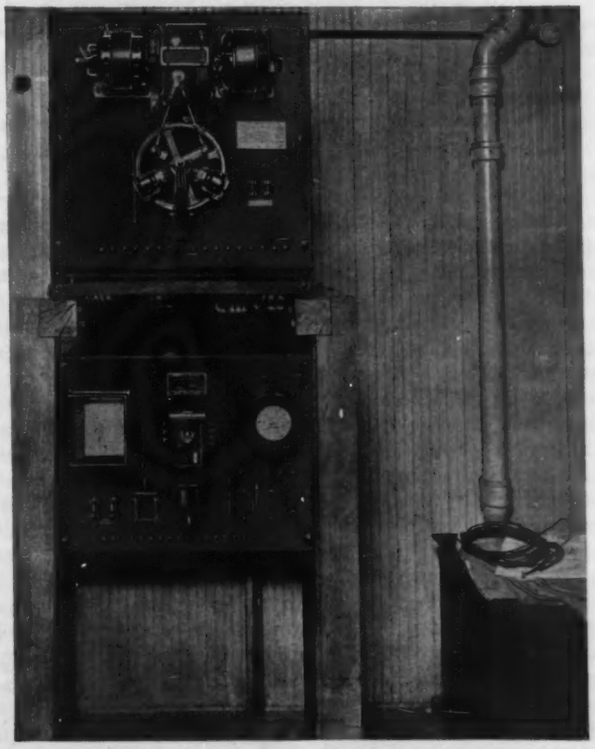
The Thomas meter is different from all other forms of gas measuring devices, in that it records the cubic feet of gas per hour in the standard units of 30 inches of mercury and 60 degrees of Fahr., without any corrections for pressure and temperature. Further, it records this measure on a graphic chart which shows the amount and variation of the gas flow, and on an integrating instrument which shows the total gas during any given period.

The direct measurement of the gas in standard units is accomplished by warming it just two degrees with an electric heater as it flows through the meter, and measuring accurately the quantity of electricity required to do this warming. If just enough heat is introduced into the flowing stream of gas to warm it two degrees, a measure of this quantity of heat constitutes a measure of the rate of flow of gas in standard cubic feet regardless of the existing pressure, temperature, or volume of the gas. The necessary heat is furnished by an electric heater coil and the amount of current necessary to raise the gas two degrees is regulated by two electrical thermometers. In the accompanying illustrations,

the graphic meter is located on the left-hand side, and the integrating meter on the right-hand side of the instrument panel. These meters record the gas in standard units of 30 inches of mercury and 60 degrees Fahr. The entire equipment was furnished and its installation supervised by The Cutler-Hammer Manufacturing Company of Milwaukee.



Thomas meter housing in pipe line



Regulating panel (shown above) with recording panel with graphic and totalizing meters below

The Thomas meter is a very desirable load for any central station company. The meters may be operated either on direct or alternating current at 110 or 220 volts and the alternating current may be either 25 or 60 cycle single phase. Under normal operating conditions the load will be at practically unity power factor and with a load factor close to 100 per cent.

THE A. & F. ELECTRIC WATER HEATER

The storage system of hot water heating, while of comparatively recent use in this country, has been successfully operated in Europe for the past 15 years. It is ideal in that it maintains an ever available supply of hot water for the householder and it represents a continuous load for the central station. The demand is quite low, in actual practice 600 to 1000 watts, and being always in use, it provides the highest possible load factor, namely 100%.

A storage water heater

This storage or 24 hour system so far is only practical where the power company will offer a flat rate. This is actually figured at from $2 to $5 per month per kilowatt. It is customary to install the heater on a double-throw switch in connection with a range so that they are not both on the line at the same time. The law maximum demand means no extra transformer and copper cost and the water is always hot and ready for service.

Central stations aggressively pushing ranges often overlook the fact that the hot water heating feature is nearly always involved in the range sale and it is difficult to understand why a lot of them will advise the customer to buy a coal or gas heater and lose this additional revenue and the splendid annual load factor the plant will have with water heating added.

The central station men should realize that this water heater operates over a large area, which is practically 200 square inches. It is ready to apply and there is no padding or cementing necessary and no plumbing to be done. It can be applied with the tools carried by any wireman.

Of course the tank should in all cases be heat insulated. Electrical water heating is grossly insufficient otherwise and should never be installed without a lagged tank, although some central stations using a 1000 watt heater claim to use the bare tank successfully.

The efficiency of a 600 watt A. & F. heater with 1 inch hair felt covering on the tank is approximately 85%. Without the lagging it is about 50%, which means that with a non-insulated tank about 215 watts will be steadily wasted and with a 1000 watt heater 360 watts. Reduced to terms of dollars and cents, on a 1c per kw. hour rate, this is $1.54 and $2.58 per month respectively.

BOOKS AND BULLETINS

Annual Reports

The annual report of the chief of the Bureau of Foreign and Domestic Commerce discusses the general conditions of import and export trade, foreign trade-marks, the use of motion pictures to stimulate trade, education along trade lines, and the work and plans of the various divisions of the Bureau's work. The importance of this Bureau's activities can hardly be exaggerated and that they are being made use of to a greater and gratifying extent is clearly pointed out in this report.

The Director of Standards' annual report for the year ended June 30, 1918, is now in published form. The functions of the Bureau and the scope of its work are briefly summarized in an insert and then the work of the past year and plans for the future are discussed at some length. Work in electro-chemistry and electricity proper has furnished considerable material for tests and published reports which are here briefly summarized.

Seattle Light Department Report

The total cost of operating and maintaining the Seattle light department for 1918 is estimated at $1,223,527.35; revenue at $1,641,402.81, and net surplus at $417,875.46, in a lengthy report on comparative cost data of electric energy from 1910 to 1917 inclusive, which has just been placed in the hands of the mayor and city council. The report covers every detail of cost data of the department for the years mentioned and is supplemented by a report on the expenses and net surplus of the department for the first six months of 1918 and estimated expenses of operation and maintenance and the net surplus for the year 1918.

The operation and maintenance for 1918 exclusive of fuel oil is given as $585,764.64; fuel oil $302,695.75; total estimated operation and maintenance expense, $888,460.39, to which is added: Depreciation, $209,258.64, and interest, $125,808.32. Total estimated cost of department, $1,223,527.35; total estimated revenues, $1,641,402.81, and total net surplus, $417,875.46.

The estimate for 1919 is given as follows:

Operation and maintenance, except fuel oil	$ 593,619.50
Fuel oil	570,000.00
Total	$1,163,619.50
Depreciation	217,000.00
Interest	145,808.32
Total Cost	$1,525,927.82
Revenues	$2,140,000.00
Net surplus	$ 614,072.18

Toluol Recovery

This paper gives a description of toluol plant construction and operation, a discussion of the various results which can be obtained, and a brief outline of the cost of carrying out this recovery. A discussion of the relation of toluol recovery to standards for gas service is also given. Typical forms of contracts which the Ordnance Department has used in contracting for the construction and operation of government owned toluol recovery plants in connection with city gas works are also given.

A Bureau of Mines Bulletin

The Bureau of Mines, Department of the nterior, announces the publication of Bulletin 170, "Extinguishing and Preventing Oil and Gas Fires," by C. P. Bowie, petroleum engineer.

In part this publication covers oil fires during the period of ten years from January 1, 1908, to January 1, 1918. During this time approximately 12,850,000 barrels of oil and 5,024,506,000 cubic feet of gas were destroyed by fire in the United States, entailing a total estimated property loss of $25,254,200. During this period 503 fires were reported, of which 310 were caused by lightning and 193 by other causes.

For the past three years Mr. Bowie has been conducting investigations to determine the nature and specific causes of these fires, with a view to suggesting means whereby they may be successfully combated and in some cases perhaps entirely eliminated.

As the subject of oil and gas fires is necessarily a broad one no attempt is made in this bulletin to treat it exhaustively. Rather, the bulletin aims to point out what has been done by operators in the past and to describe various fire-prevention methods and fire-fighting apparatus which are being used or adopted by many of the larger oil companies. These methods and apparatus, it is believed, if uniformly employed by operators, will largely decrease the present enormous annual fire losses.

A complete description is given of the frothy mixture system for extinguishing tank fires, which includes detailed plans used on typical installations and photographs showing the construction and, as far as possible, operation of these plants after completion. Formulae for the chemical solutions used are given as well as instructions for their preparation. The author includes a thorough discussion of the advantages and disadvantages of the method.

Through the bulletin Mr. Bowie has confined his discussion to actual fires and extinguishing methods that have proved successful. Having a wide personal experience in the construction of pipe lines, pump stations, and fire-fighting equipment prior to his association with the Bureau of Mines, he is well equipped to cover the subject from all angles. This fact is borne out by the emphasis given in his bulletin to those details of fire fighting and prevention apparatus so easily overlooked in ordinary construction work and which, if not properly designed and cared for, may prevent the entire installation from functioning at a critical moment.

In the closing chapter miscellaneous fire hazards and preventions are covered in a brief and comprehensive statement, emphasizing clearly and emphatically those practices which are dangerous in construction and operation of garages, refineries and around oil wells, as well as how they may be avoided.

Public Utility Rate Fixing

by C. E. Grunsky. Comments on current problems pertaining to public utilities and to rate fixing. Size 6 by 8½ in.; 169 pp.; 8 illustrations, including diagrams; cloth binding. Published by the Technical Publishing Company and for sale at the Technical Book Shop, 171-3 Second St., San Francisco. Price $2.50.

There has long been a deep-felt want for a simple yet comprehensive discussion of many of the current problems that prove perplexing in utility affairs—especially in those problems relating to rate fixing. This book discusses the elements deserving special consideration when rates are to be fixed, passes to the appraisal of real estate adapted to special use, and follows by a most helpful treatment of the determination of the value of real estate in eminent domain proceedings. The value of a water-right—a matter of tremendous importance in the West—is then discussed. The concluding chapters of the book are devoted to the subject of arriving at a fair rate return and in the discussion many of the points brought out by the author in the celebrated Spring Valley case are used as illustrations. Of the many books that have appeared on the subject of rate fixing often the subject matter is enlarged in so many complicated technical terms as to make the reasoning difficult to follow. It is believed that this book, speaking the last word on the subject, in that it has been completed by the author since the signing of the armistice, and due to its unusually clear treatment by an authority of such high standing, adds a new acquisition to the book shelf that will prove unusually helpful to the regulating commissions and to the various utility engineers in the readjustment period that now faces the nation.

NEW ELECTRICAL DEVELOPMENTS

(Several bond issues have been successfully floated in the Northwest; demands for electricity for mining and industrial purposes are noted in the Pacific Central region; a sixteen million dollar bond issue has been permitted in the south and various activities in the Inter-mountain district which will mean additional loads for the power companies, all point to the greater prosperities of peace times—and the coming spring.—The Editor.)

THE PACIFIC NORTHWEST

SQUAMISH, B. C.—A hydroelectric plint, it is reported, will be installed in Squamish by the government in connection with other extensive improvements here.

SEATTLE, WASH.—At a meeting of the city utilities and finance committee, it was decided to pass over the veto of the mayor, the ordinance appropriating $10,000 to be used to complete the Ballard light substation.

SEATTLE, WASH.—A resolution was adopted directing the city comptroller to call for bids to be opened Feb. 15, for $750,000 light utility bonds of the issue of $1,755,000 recently authorized by ordinance of the council.

SEATTLE, WASH.—Plans are being prepared for a two-story reinforced concrete transformer house 20 x 50 feet in dimensions for the Skinner & Eddy Corporation at 1041 Railroad avenue. Day labor will be employed in construction.

PORTLAND, ORE.—Sealed bids have been called by the Commission of Public Docks for furnishing materials and wiring for Pier 1, St. Johns Terminal, for light and power and a roadway leading to Pier 1 for light. The right to reject any and all bids is reserved.

SEATTLE, WASH.—The city council has been requested by its special legislative committee to urge in the legislature the passage of a bill which will permit the city to extend its activities outside the city limits, having particularly in view the selling of electric power and water.

ANACORTES, WASH.—All tenders for the waterworks purchase bonds were rejected by the city council, pending further negotiations with the Washington Water Power & Light Company. Further bids may be asked for at any time under the waterworks purchase ordinance.

MARSHFIELD, ORE.—A movement is on foot to unite the cities of Marshfield and North Bend, Oregon, and extend the city limits to include several suburban communities. Coos Bay has been chosen as the name for the enlarged city. This territory is served by the Mountain States Power Company.

SALEM, ORE.—Guaranty of irrigation bonds by the state through the provisions of a constitutional amendment that will give the officials of the state that power, is the plan now being whipped into shape for submission to the legislature and through it to the people by Representative Gallagher of Malheur county.

VANCOUVER, B. C.—Contracts have been awarded to the C. H. E. Williams Company, electrical contractors, for the installation of electrical equipment on twelve 1500-ton and ten 3200-ton schooners under construction by the Northern Construction Company, Ltd. of Vancouver, and the New Westminster Construction & Engineering Company, Ltd.

SALEM, ORE.—Warden Stevens of the state penitentiary states that he has been informed by Franklin T. Griffith, president of the Portland Railway, Light & Power Company, that if it is shown that substantial saving can be made the company will waive the contract which binds the state to secure all of its light and power from the company, thereby permitting the state to install a plant at a cost of about $3000 for lighting the penitentiary and asylum.

SEATTLE, WASH.—The Rothert Process Steel Company, 622 Harriman street, of which E. H. Rothert is president, makers of high carbon tool steels and high speed tool steels, is installing new equipment designed to bring its plant capacity up to 10 to 15 tons per day. Items in this equipment are: Furnaces, finishing equipment, steam hammer, reheating furnace and annealing furnace. To facilitate operations three transformers of 175 kva. each are being installed.

SEATTLE, WASH.—The city of Seattle won the first court action to put through the $15,000,000 deal for the purchase of the street railway system of the Puget Sound Traction Light & Power Company. The city was sustained by the Superior Court in the cases of F. A. Twitchell and Chas. E. Horton, taxpayers who attacked the legality of the purchase on the ground that the bonds the city is to issue would become subject to liquidation out of the general fund and therefore on the taxing power.

TACOMA, WASH.—At the conclusion of a conference in which the state public service commission and port district commissioners of King, Snohomish and Pierce counties participated, a tentative bill was drafted to be presented to the state legislature providing for the creation of a public utility district, to handle all freight and passenger traffic at Seattle, Tacoma and Everett. The bill provides for a commission of 9 members, 3 from each county, to handle the work of the terminal district. The consummation of this plan is expected to call for extensive electrification of railway lines in Seattle, Tacoma, and Everett.

SEATTLE, WASH.—The Pacific Machine Shop and Manufacturing Company has secured the contract to manufacture and equip the five wooden hull motor vessels which the Patterson MacDonald Shipbuilding Company of this city are building for the Australian Government, with all the electrical auxiliaries, such as anchor, windlasses, cargo winches, capstans and steering gear with electric telemotors, also the generating sets and switch boards to furnish and control power for the auxiliaries, consisting of direct current generators, directly coupled to a crude oil burning engine.

SEATTLE, WASH.—Plans have been completed for finishing the interior of the Seventh avenue and Jefferson street power substation for the Puget Sound Traction Light & Power Company, which was destroyed by fire several weeks ago. The roof is being replaced at present and Stone & Webster will begin at once replacing the first floor and balcony and putting the interior in position to receive the new dynamos and other machinery to be installed. Fire loss to the building was estimated at $20,666. The loss to machinery has not yet been definitely ascertained.

KLAMATH FALLS, ORE.—A big dam at the head of Link river for the reclamation of 70,000 acres of land in the Wood River Valley, which will be a big factor in making the Upper Klamath Lake better adaptable for logging purposes, will be completed this year, in all probability, according to George Walton, manager of the California-Oregon Power Company. Mr. Walton declares that while the water in the lake will be raised to some extent by the installation of the dam, it will at no time be above the present high water mark, and it will regulate the flow of water to the Copco dam, about 45 miles down the Klamath river.

SPOKANE, WASH.—The citizens of Spokane, Wash., have purchased $2,000,000 of the $3,000,000 note issue of the Washington Water Power Company. The issue was placed primarily for refunding notes of practically a similar amount floated a year ago. The notes are secured by the first refunding mortgage bonds of the company which are held as collateral in the amount of $1200 for each $1000 in notes.

The notes are payable February 22, 1920, with interest at 7 per cent. It is possible that another issue of $800,000 may be placed on the market later as that amount will be required to pay for improvements at the Long Lake where an additional installation of 16,500 electric horsepower is being made to provide for the demands of the Chicago, Milwaukee & St. Paul Railway in its electrification of the system from Avery, Idaho, to the Columbia river.

TACOMA, WASH.—The city council has passed without a dissenting vote the ordinance authorizing the purchase of the Lake Cushman power site, the city to pay $300,000 in utility bonds for 8,000 acres. The utility bonds will be 6 per cent bonds, payable serially in from two to ten years out of light and power funds. According to the present estimate the cost of development will reach $5,000,000, the work requiring one and a half to two years after the city is ready to begin. The site has been estimated by engineers as capable of producing 75,000 continuous horsepower on a 50 per cent load factor. The transmission line as at present planned, with a span across the Narrows, will be about 40 miles in length. It will take some time to clear up title to all the lands included in the transfer. In the meantime E. C. Wilmann, an auto mechanic in the employ of the Standard Oil Company, has brought suit to prevent the city from signing a contract for the purchase on the ground that the city has no legal authority to make the purchase without submitting the proposition to a vote of the people.

THE PACIFIC CENTRAL DISTRICT

OAKDALE, CAL.—The Oakdale Irrigation District has just completed the survey of a site for a new reservoir to be built at Melones, capable of impounding 100,000 acre feet of water.

EUREKA, CAL.—The Eureka division of Western States Gas & Electric Company is constructing a branch line to supply the electrical energy requirements of the Humboldt Transit Company. This line will be completed within the next week.

SACRAMENTO, CAL.—There was only one bid for supplying the city with electric lamps for the year 1919. This came from the Pacific Gas & Electric Company and is for $3,600. The bid was referred to Commissioner of Public Works Thomas Coulter.

OAKLAND, CAL.—The Key Route system announced a few days ago that funds had been deposited with the Wells Fargo Nevada National Bank to pay the coupon due January 7, 1918, of the first consolidated 6 per cent gold bonds of the Oakland Transit Company, a subsidiary.

MADERA, CAL.—The San Joaquin Light and Power Corporation is to build a new substation and power line to supply the district west and south of Chowchilla. The new plant will be erected five miles west of Chowchilla on the Robertson boulevard. A 60,000-volt transmission line also will be built.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company is contemplating rebuilding its distributing systems at both Bryon and Brentwood, with an independent substation at each place, on a 110-220 volt circuit. The plans provide for a lighting district in each town if the property owners so decide. C. S. Northcutt of Modesto is district manager.

SACRAMENTO, CAL.—A contract has been awarded by the Northern California Milk Producers' Association to the Clinton Construction Company of San Francisco for the construction of a new plant, which will include a cold-storage plant, power house, and a 30,000 gallon fuel oil tank. The cost of the plant is estimated at about $125,000. Henry M. Ellis is manager.

STOCKTON, CAL.—The National Paper Product Company has completed its million dollar plant and started operations with 150 men. An additional 100 men will be employed as soon as possible. The plant has a capacity of 80 tons per day, a monthly payroll of $40,000, and utilizes electric power from the Western States Gas & Electric Company to the extent of 1400 horsepower.

COLUSA, CAL.—Some progressive farmers who live on the east side of the river near Princeton have formed a copartnership irrigation company, known as the Afton Irrigation Company. The tract that will go under water comprises 970 acres of land and the entire project has been leased for rice for two years to Attorney Ben R. Ragain of Colusa, who will install pumps and put in ditches.

SACRAMENTO, CAL.—The proposal to form an irrigation district in Big Valley, near Beaver, Modoc county, was presented to the State Department of Engineering during the visit of W. H. Chase, secretary of the Northern California counties, who headed a delegation of citizens. The project as outlined to Major Paul M. Norboe, assistant engineer, calls for the irrigation of 20,000 acres located in Modoc and Lassen counties.

LOS GATOS, CAL.—City Engineer Walker stated that he had investigated the lighting system and that he was of the opinion that considerable money could be saved and better service rendered if the city did away with the present arc lamps and installed 400 candle power lamps and placed the entire system on a meter. He estimated that it would cost about $800 to make the change. He was instructed to carry on further investigation.

HOLLISTER, CAL.—Rights-of-way papers for the King City-New Idria power line have been filed by the Coast Valleys Gas and Electric Company and work will begin shortly. The proposed line will cost in the neighborhood of $85,000 and when completed all machinery at the New Idria quicksilver mines will be run by electricity. At present the company generates its power with Diesel engines, using crude oil as fuel. The oil is hauled in from Mendota and is a source of heavy expense and inconvenience, being handled by truck.

ALTURAS, CAL.—The farmers along Pit river are planning to establish pumping stations on the river for the purpose of taking water out of the stream next summer for irrigating crops. The construction of five miles of power line and the installation of at least 65-horsepower motors have been arranged. A committee, J. E. Belknap, James Fitzhugh, B. W. Spicer, Silas Kelley and H. Stuber, is conferring here with I. W. Gibbins, manager of the Alturas Electric Light and Power Company. The promoters expect to complete the construction work by April 1.

SACRAMENTO, CAL.—A party of engineers of the Northern Electric Railway, working under the direction of a Sutter basin engineer, is making a reconnaissance survey of a proposed electric road through the Sutter Basin. The proposed line will connect with a branch of the Northern Electric railway to Woodland, about 2½ miles out of Woodland, thence constructed northerly about six miles, crossing the Sacramento river at a point five miles below Knight's Landing and thence up through the center of reclamation district 1500.

THE PACIFIC SOUTHWEST

GLENDALE, CAL.—The city rates on electricity were recently raised from 2c to 2.3c per kw-hr., service charges at the same time being changed from 50 to 75 cents.

LOS ANGELES, CAL.—The commission has authorized the construction of a power transmission line to serve the water bureau's pumping plant in the Elendale district at a cost of $4100.

CHANDLER, ARIZ.—Permission has been granted to the Chandler Water & Light Company by the Arizona Corporation Commission to issue $5,000 in bonds for improvements to its system.

SAN DIEGO, CAL.—The San Diego Electric Railway Company has begun work on the construction of an extension of its system to the local shipbuilding plant. The cost of the work is estimated at $50,000.

ARCADIA, CAL.—The Board of City Trustees has accepted the bid of Fairbanks-Morse Company, of $987, for a new 5 h.p. motor to be installed at the municipal water plant.

HEMET, CAL.—First steps for the purchase of the property of the Lake Hemet Water Company by the consumers under the system were taken at a recent meeting held at the Little Lake school house by the Consumers' League.

SAN PEDRO, CAL.—The Edison Company will enlarge its system at the Los Angeles harbor, according to the report of Chief Electrical Engineer Scattergood of the Municipal Bureau of Power and Light, and B. W. Mathews, Special Counsel.

LOS ANGELES, CAL.—Plans are being prepared by A. C. Martin, architect, Higgins Building, for the erection of a steel plant on Santa Fe Avenue, to include machine shop, foundry, warehouses, etc. The cost is estimated at about $100,000.

LOS ANGELES, CAL.—Commander Norman Smith, public works officer for the 12th Naval District, announced in San Diego that the Navy Department plans early construction on a radio building at Inglewood, Cal., which will make that station one of the most important on the Pacific Coast.

CALEXICO, CAL.—The city trustees are making an investigation as to installing a municipal electric light and power plant. Mayor Abbot has been instructed to study the city plants of Pasadena and Glendale and make a report with recommendations. The rates charged by the Holton Power Company are declared too high.

HOLBROOK, ARIZ.—W. H. Clark of Los Angeles, Cal., it is reported, is head of a group of capitalists who contemplate a power project in a large lignite coal field about 72 miles southwest of Holbrook, and the erection of transmission lines to Globe and Miami, 75 miles to the southward, to points on the Santa Fe Railroad, and even to the mining districts around Prescott.

NOGALES, ARIZ.—At a recent meeting of the Nogales town council, proposals that had been invited for the installation of a modern lighting system were considered by the board. It is understood that the town will not be responsible for any initial outlay for installation, everything being supplied by the proposing corporation, and the town will pay for the service, giving a contract for five years or more.

EL SEGUNDA, CAL.—A resolution was introduced at a Board of Trustees meeting offering for sale to the highest bidder the gas franchise for the city of El Segunda, which is to run 10 years. After five years, the Southern California Gas Company is to pay the city 2% of its gross earnings. Bids will be opened February 13, 1919. It is in the intention of the gas company to commence work immediately upon the awarding of the franchise.

LOS ANGELES, CAL.—Approval of the issuance and sale of $16,000,000 of its new securities is sought in an application filed recently by the Southern California Edison Company with the State Railroad Commission in San Francisco. The new financing is designed to put the company in position to begin work on a program for the development of 150,000 additional horsepower in hydroelectric plants to serve communities in the San Joaquin valley and in Southern California.

AZTEC, N. M.—The Southwestern Colorado Milling Company is going to develop the San Juan basin. They have purchased the Armstrong mill at Main and 15th streets in Durango, Colo., and have arranged to take over the Aztec Light & Power Company and mill at Aztec. The Durango mill will be remodeled at considerable cost and a large number of new buildings will be added. Work will be commenced in a few days on the Tiffany and Aztec plants, and shortly on Plant No. 4 in the Montezuma valley between Mancos and Cortez.

BLYTHE, CAL.—Material for the construction of a telephone line from Blythe to Rannels has been ordered by S. D. Kamrar, manager of the Colorado River Telephone Company. Work on the new line will be started immediately upon arrival of the material. It is stipulated that work will be finished by March 15th. The Palo Verde Mutual Land and Water Company will have its private wire on the line, but has agreed to sublease poles to Mr. Kamrar for public use. The new line will follow the Rannels canal as nearly as possible—will go directly south from Blythe to catch the Rannels ditch at Neighbors. Branch lines will also be built.

SAN DIEGO, CAL.—The Vista water committee plans early action on a great project to develop the country. The committee met a few days ago to take into consideration the findings of expense as reported by Engineer W. F. McClure with reference to getting water from the Volcan Water Company for the contemplated San Luis Rey irrigation district. The plan contemplates the use of water of the San Luis Rey river, from which it will be diverted at the Werner Reservoir, taken down the south side of the river across the Valley Center country to a point near Vista, via the head of Twin Oak Valley. The water company will reserve the right to develop power as a by-product at the power drops on the main supply canal, in consideration for which the company will build power houses, machinery and steel penstocks.

THE INTER-MOUNTAIN DISTRICT

TONOPAH, NEV.—If proposals by the residents of Tonopah are accepted, the Tonopah Water Company will operate the plant at the Navada Gas Company, and Tonopah again will have a gas supply. The plant was closed three weeks ago because it was running behind each month.

BOULDER, COL.—The Cities' Service Company has purchased the control of the Western Light & Power Company, which operates in Boulder, Berthound, Fort Collins, Windsor, Superior, Loveland, Greeley, Louisville, Lafayette and other points in Northern Colorado. Improvements involving an expenditure of over $1,000,000, it is understood, are contemplated.

OGDEN, UTAH—The city council is considering the question of establishing a municipal electric light plant.

WEEDE, MONT.—The Musselshell Valley Power Company has been incorporated here.

GILMAN, MONT.—The Commercial Club has appointed a committee to confer with business men on the question of constructing an electric light plant here. A financier is ready to erect such a plant and will do so if he has the support of residents.

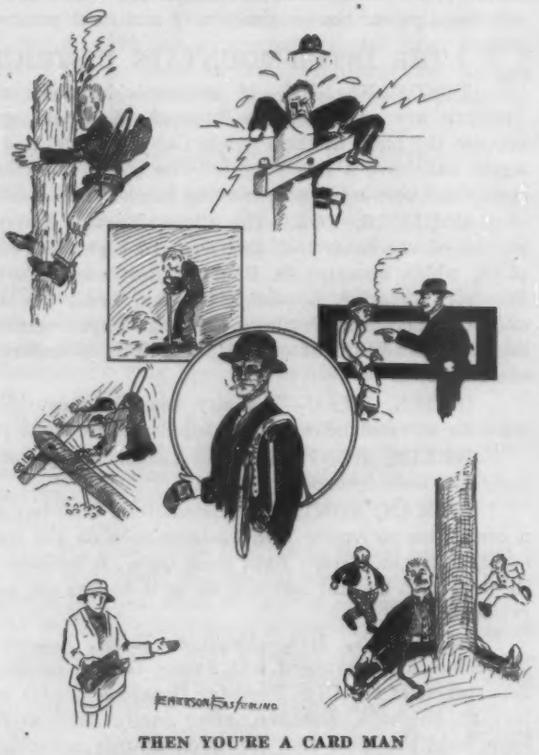
LEWISTON, IDA.—Engineer E. W. Kramer of the hydroelectric department and James Gerard of the logging department of the U. S. Forestry Department with headquarters at Missoula, Montana, after preliminary investigation here, hold the view that Lewiston affords natural facilities for location of a sawmilling plant of 15,000,000 to 20,000,000 feet capacity annually, with a possibility of further development through dam construction in the river to furnish power. Engineer Kramer is quoted as saying in connection with the development of power that "The construction of the dam at Dry Gulch would develop at least 50,000 horsepower. I find conditions here far more favorable for hydroelectric development than I had anticipated."

COOK CITY, MONT.—The Western Smelter & Power Company with mine, smelter and power plant at this place expects to install a 100 h.p. motor to drive an air compressor at its mine, and to install additional transformers at its hydroelectric plant with which to step up voltage to 23,000 for transmission to other mines of the district. The company supplies lighting for this place also. It is to resume the operation of its smelter during the coming summer and is to build an aerial tramway two miles long to transport ore from its mine to the smelter. G. L. Tanzer of Seattle is president of the company.

THE VACUUM CLEANER —— THE VACUUM CLEANER

SIDE LIGHTS are most illuminating in bringing out the shadows and modeling of the object displayed — and this holds good for persons and events as well as statuary. At least this is the theory of the Office Vacuum Cleaner who is here permitted to select such rays from the items which collect in its capacious bag as may prove especially illuminating.—The Editor.

The troubles of a line man are here immortalized in verse and picture by one of our electrical friends from Ashland, Oregon. If the verse is studied carefully,—or better still, the sketch,—it will need no reading between the lines to see why our electrical men made such good soldiers.



THEN YOU'RE A CARD MAN

After you've grunted your half a year; after they've granted your card so dear:
After a whole kit of tools you have lost; after you've staggered at the mount of the cost:
After you're thoroughly loaded for bear; after you've learned to work and to swear:
After you know what 'dead' and 'live' means, after you've been jerked loose from your jeans:
After you've seen them get the wrong wire, after you've seen them play with the fire:
After you've had a dozen close calls, after you've had your share of the falls:
After you've burned a score of poles; after they've likened your head to the coals;
After you've burned up half a town; after you've made a line burn down:
After you've burned up the pots by the bank; after your spurs have broke off at the shank:
After your safety has pulled loose or broke; after you've 'most felt the heat of the coke:
After you've found yourself at a loss, after you've learned that the foreman's the boss:
When you've put in at last your three years as a groundman—
Then they've gave you your card—and you are a lineman.

—EMERSON ESTERLING.

To begin the dry season with the date of July 1st is a new adjustment of California climate, where the natives are accustomed to plan picnics with impunity the year round. Speaking strictly of the climate, however, the umbrella-bounded Easterner cannot get used to the idea of leaving home for an extended trip without this modern adjunct of civilization. Perhaps it was this fear of thundershowers and spring torrents, or perhaps it had to with the shifting of the dry season above referred to, but at any rate, the eastern representatives of the Westinghouse Agent-Jobbers' Association which is to meet at Del Monte during the week of May 4 to 11 were greatly concerned with the question of wetness. Here is the reply sent them by S. H. Taylor of the Electric Ry. & Mfgrs. Supply Co., who is largely responsible for the holding of the convention on this coast:

"Out here in California, where the orange turns to gold,
And nature has forgotten the art of growing cold,
There's not a day in all the year that flowers do not grow,
There's not a single moment that songsters do not sing,
And there's a constant conflict between summer and the spring
Oh, just the joy of it were worth one life to give,
Out here in California where it's just a joy to live."

The following contribution to the literature of the influenza epidemic is published in the Pacific Service Magazine as sent in from the office of Mr. W. G. Vincent, Valuation Engineer:

A malignant Spanish bacillus
Came over the ocean to kill us,
But it struck a real snag
In masks made of rag,
More effective than doctors who pill us!

Now that prohibition has become a national affair, it is perhaps taking no unfair advantage of the dry climate of the Northwest to tell the story on Oregon. There were various methods of obtaining vanilla extract and like reprehensible and alcoholic beverages devised for the arid population—and the gentleman who crossed the border from the south selling bottles of a dark liquid which he called tea found an excellent market. His method was to obscurely inquire as to the market for tea of thirsty appearing citizens, accompanying the question by a hollow whisper and a wink—and he had considerable success, getting as much as $10 and $15 in some cases. Later after he had disappeared and recrossed the line, the purchasers discovered that dark liquid of the purchase really was tea! The rest is unquotable.

ENGINEERS OF YESTERDAY

2. HERO

(A Series Compiled by A. L. Jordan)

Is the steam turbine a modern or an ancient invention?

In the writings of Hero, a Greek of Alexandria, is found a description of a toy called an "eolipile." When steam from the boiler below escapes from the two openings, the globe revolves. This is then the beginning of the story of the modern steam reaction turbine.

THE VACUUM CLEANER —— THE VACUUM CLEANER